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ABSTRACT

A study examined the tonal patterns in Komo, a sub-Bantu language of about 200,000 speakers in Zaire. It investigated: (1) the minimal lexical specifications necessary for Komo tones; (2) what sort of tonal alternations exist and how they may be accounted for most simply with rules; (3) how tonal phenomena interact with Komo morphology; and (4) at what level of derivation the various tone rules apply. Three strata of derivation (the two lexical strata of derivation and inflection, and a post-lexical stratum of phonological phrase formation) are used as an organizational basis for describing tonal phenomena. The resulting report gives an overview of Komo lexical tone for nouns and verbs and proceeds to analyze tone patterns in each stratum. A concluding section outlines the resulting rules. Notes on instrumental analysis of downstep and a list of abbreviations are appended, and a 23-item bibliography is included. (MSE)

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TONE IN KOMO[1]

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[1]I wish to thank the leadership of the Communauté évangélique de Christ au coeur de l'Afrique for having recognized the importance of linguistic study as a precursor to Bible translation, the primary task for which they have sponsored my presence in Zaire. I also wish to thank certain Komo co-workers who provided data and are anxious to bring their language 'onto the map', namely, Katinga Mbokani, Omari Muzalia, and Mbongo Mbaraza.

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1 Introduction

1.1 Typological description of Komo

Komo is a sub-Bantu language spoken by over 200,000 people in the regions of Maniema and Haut-Zaire in Zaire. It is spoken in the large area extending from Kisangani in the west to the Lindi, Osokari, and Mandayo Rivers near Walikale in the east.

Komo speakers are found in the Ubundu, Opienge, and Bafwasende Zones (Tshopo Subregion of Haut-Zaïre), the Lubutu and Punia Zones of the Maniema Region, and into the Walikale Zone of the Nord-Kivu Region.

Komo belongs to the following language groupings, in order of decreasing generality: Niger-Kordofanian, Niger-Congo, Benue-Congo, Bantoid, Bantu, Bira-Huku. Its Guthrie number is Kumu D23 in the Lega Kalanga group. Kutsch Lojenga and Raymond (1985) list it as one of four related languages of which the other three are Bera (Bira D32), Bila (no Guthrie number), and Bele (Peri D31) (Guthrie 1948). Recently, an additional related language has come to light: Amba (Kutsch Lojenga, personal communication).

Komo has been variously called "sub-," "semi-," and "border" Bantu because of its typological idiosyncrasy of lacking a number of productive Bantu-like noun-class prefixes. Bantu languages are characterized by a system of concord in noun phrases and between nouns and verbs; Komo has no such thing. Komo is nevertheless recognizable as a

Bantu language because of its large number of Bantu cognates, its lexicalized but recognizable noun class prefixes (Thomas, in preparation), and its agglutinative verbal morphology.

1.2 Purpose of this study

My purpose is to continue to comprehensively present and analyze Komo sound patterns as was begun in Thomas (to appear). Whereas that paper is principally concerned with advanced tongue root (ATR) and vowel height harmony, here the concentration is on tonal processes.

1.3 Research questions

I attempt to answer the following questions:

i) What are the minimal lexical specifications necessary for Komo tones?
ii) What sort of tonal alternations exist and how may they most simply be accounted for with rules?
iii) How do tonal phenomena interact with Komo morphology?
iv) At what levels of derivation do various tone rules apply?

1.4 Definition of terms

anchor. An anchor is a skeletal unit, either C, V, or N, to which an autosegment may link via the relevant arboreal structure (see the discussion on the framework, section 1.8).

associative. An associative *á* links two nouns to create a genitive phrase. So X *á* Y means literally 'X of Y', or sometimes 'Y's X'. If X is a gerund, then Y is objective if the gerund is bivalent, or subjective if the gerund is univalent. I call X the head and Y the adjunct of the construction.

autosegment. An autosegment is a feature that is not linked to any skeletal element. It may link to a skeletal unit by an association convention.

concatenate. If a morpheme is added to the left or right of a form, then that morpheme is said to have been *concatenated* to the pre-existing form.

conflate. If an autosegment is superimposed on a form, then it is said to have been *conflated* onto that form.

lexical. This refers to that part of the derivation of a word in which affixes are being concatenated (added to either side of) to a root and phonological rules are being applied in the process of concatenation.

post-lexical. This refers to processes, either phonetic or syntactico-phonological, that take place after the formation of a word.

root. A root is a morpheme that underlies a derivational or inflectional paradigm. It is the most basic input to the derivation of a word.

skeleton. This refers to the feature-bearing elements or nodes of a morpheme. It consists of a string of C's, V's, and N's, where C denotes a consonant, N a nasal, and V a vowel.

stem. A stem is a root to which zero or more derivational affixes have been added. In other words it has undergone the derivational part of its lexico-phonological derivation.

syntactico-phonological phrase, or simply *phonological phrase.* This refers to the result of combining one or more words into a single syntactical unit, often delimited by pauses, and incorporating such syntactical units as *noun phrase* and *interrogative.*

universal association convention. The universal association convention (UAC) governs the linking of free autosegments onto free anchors. It states that free autosegments are mapped onto free anchors (1) in a one-to-one relation, and (2) from left to right in the default case. If mapping is from right to left, then the UAC is said to be marked for the particular autosegment concerned (cf. Pulleyblank 1986).

word. I understand *word* to mean the output of the lexical processes of derivation and inflection. Together with other words, it forms the input to syntactico-phonological derivation.

Other terms are defined as they come up.

1.5 Data gathering methods

First, I have had the privilege of learning to speak and listen to the language during three years of living with the Komo people. I am at the point of fluency where I can speak Komo in public-speaking contexts and can test elicited paradigms when listening to everyday speech.

I have elicited paradigms, texts, and a dictionary data base of over 2500 entries. Three individuals were the principal sources of the elicitation; a number of others made smaller contributions.

I have also done some psychological experimentation using nonce, or coined, words, transliterated foreign words, and a language game utilizing syllable reversal.

Many of the paradigms have been checked by Constance Kutsch Lojenga, a consultant in phonology and phonetics. Some of the data have also been instrumentally checked. I, of course, take full responsibility for any errors in the data and analysis.

1.6 Organization of this paper

I assume that Komo has three strata of derivation (cf. Mohanan 1986). These include the two lexical strata of derivation and inflection and a post-lexical stratum of phonological phrase formation. It is my intention to use these strata as an organizational basis, showing phenomena that occur during derivation first and phenomena that occur during phonological phrase formation last.

1.7 Framework

I use a framework that incorporates the following: lexical phonology (Mohanan 1986 and Pulleyblank 1986), a hierarchical theory of distinctive feature structure (Clements 1985 as incorporated into Archangeli and Pulleyblank 1986, Snider 1988), and a theory that constrains the set of possible phonological rules (Archangeli and Pulleyblank 1986).[2]

In the course of writing a rule, I generally state it using two different frameworks. First, I state it using a parametric system devised in Archangeli and Pulleyblank (1986). However, for the benefit of the reader who is not familiar with Archangeli and Pulleyblank (1986), I restate each rule (and subsequent related processes) transformationally, in roughly the same way as Pulleyblank (1986).

The parametric system of rule writing used here incorporates (1) a hierarchical theory of distinctive feature structure as proposed in Clements (1985), and (2) a theory of phonological rules that is more constrained than in a transformational rule-writing framework. This theory of

[2]Having spent the last three years in Zaire, interaction with colleagues having a similar linguistic background to my own has been very limited. My understanding of the framework therefore results purely from going back and forth between a few written texts (the framework) and the data at hand. I therefore apologize in advance for any inadequacies in my understanding of the framework.

phonological rules constrains rules to either insert or delete hierarchical structure or feature content. For example, the parametric system does not permit alpha switch rules or rules of metathesis, both of which are regarded as overly powerful potential rules of the transformational rule system.

My overriding purpose, however, is to bring to light Komo tonal data. I hope that I have arranged the data in a sufficiently logical and copious fashion as to make it accessible to those having a variety of linguistic persuasions.

2 Komo lexical tone

2.1 Nouns

In most Komo nouns, each syllable has a discrete, level tone. The following table lists the possible tones on two syllable nouns, each line representing a possible combination of tones, as indicated in the leftmost column. In the representations that follow, an acute accent indicates a high tone; the lack of an accent indicates a low tone.

(1) Tone in two syllable nouns

HH:	ɓúɓú	'chicken louse'	cíɗɔ́	'jigger'
HL:	ésɔ	'voice'	gbútu	'staff'
LH:	abé	'father'	cengú	'venom'
LL:	ɲɔngɔ	'word'	isɛ	'elephant trap'

Thus, all possible combinations, or melodies, of the two tones, high and low, are attested in bisyllabic nouns. In monosyllabic nouns, however, an additional tone appears: a rising contour.

(2) Tone in monosyllabic nouns

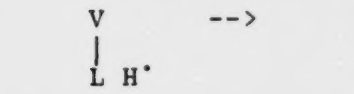
H:	jɔ́	'woman's panier'	nké	'woman'
R:	mɔ̌	'head'	mě	'tree'
L:	na	'and'	ngi	'fly'

The problem then concerns accounting for the rising tone. Here, I analyze it as being a combination of an L tone and an H tone. The universal association convention (UAC, defined in section 1.4) can only link the L; a rule is needed to link the H.

(3) H retrolinking[3]

I. c. structure
d. opposite direction
II. [+upper]
III. trigger: free
target: linked

Graphically, where T is any tone:[4]



What (3) says is that a leftover H autosegment is linked leftwards.[5] If the vowel to the left is already

---

[3]This is *retro*linking in the sense that, if T_1 precedes T_2 on the tonal level, and if skeletal position X_1 is in correspondence upon applying the UAC with T_1, then X_1 precedes T_2 and T_2 is said to be linking to the left, and in this case in the opposite direction of the UAC for tone, which is left to right. H retrolinking comes up again in sections 2.2.4 and 4.2.3. In the latter case, an autosegmental H stemming from the third person plural object morpheme must link leftwards onto a prefix rather than rightwards onto a verb stem in the same sense as the UAC for tone.

I am adopting the rule-writing format of Archangeli and Pulleyblank (1986). In this format, a rule consists of three parts. Part I contains a list of parametric settings, part II the argument of the rule, and part III trigger or target conditions.

There are four parameters in part I, each parameter having both a marked and a default setting. Default settings are not overtly stated in a rule. Here is a list of these parameters, where the first parameter, in parentheses, is the default setting or core specification, and the second setting is the marked or stipulated specification.

I. a. (insert)$_{def}$/delete
b. (maximal)$_{def}$/minimal
c. (content)$_{def}$/structure
d. (same direction)$_{def}$/opposite direction/bidirectional

[4]A degree sign [°] after a tone indicates that it is floating. The lack of the same indicates that it is linked to the vowel above it.

[5]See footnote 2, first paragraph.

linked to a high tone, then the obligatory contour principle (OCP) prevents the H from associating.[6]

A derivation in the case of a monosyllabic noun is straightforward.

(4) Derivation of *mɔ̃* 'head'

```
mɔ                  lexical entry

 L•H•

mɔ                  UAC
 |
 L H•

mɔ̃                  H retrolinking (3) (output)
 |\
 L H
```

This rule comes into play again in the discussion of the third person plural object prefix.

2.2 Verb stems

2.2.1 Stem classes I and II. TAM tone markers.

The situation is more complex with verb stems.

In the gerund and perfective, a two-syllable stem can usually have only two melodies, HH and LH. That is, the second syllable always carries a high tone.

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[6]The Obligatory Contour Principle (OCP) prohibits representations in which adjacent autosegments are identical.

```
*X  Y
 |  |
 F  F
```

where F is a feature having a determined value and X and Y are adjacent F-bearing units. In the diagram, either the second F is constrained by the OCP from linking in the first place, or, if the diagram is the result of bracket erasure, minimal changes take place to resolve the violation. Such a resolution would be the following diagram.

```
X  Y
| /
F
```

Archangeli and Pulleyblank (1986:131ff) discuss the OCP as I understand it.

(5) Verb tone melodies: gerund[7]

HH:	bɛ́ɗá	'take'	ɓɛ́tá	'hit'
LH:	ɟɔngá	'speak'	kpangá	'begin'

(6) Verb-stem tone melodies: perfective

HH:	bɛ́ɗí	'take'	ɓɛ́tí	'hit'
LH:	ɟɔngí	'speak'	kpangí	'begin'

In the imperfective, the same verbs as in (5) and (6) always have a low tone on the second syllable.

(7) Verb-stem tone melodies: imperfective

HL:	bɛ́ɗa	'take'	ɓɛ́ta	'hit'
LL:	ɟɔnga	'speak'	kpanga	'begin'

In (5) - (7), the tone on the first syllable of the stem is invariable while the tone on the second syllable varies with the tense-aspect-mood (TAM) configuration of the stem. Only the first tone, therefore, lexically characterizes the verb stem.

In other words, tone is a lexical property of the verb stem. Within the autosegmental framework, it is not a property of any segment within the verb, since the UAC assigns the stem-class tone to the leftmost syllable automatically in the unmarked case.[8] I therefore propose two verb-stem tone classes, one for low-tone stems and one for high-tone stems. I call them stem classes I and II, respectively.

Similarly, the TAM of a stem can be lexically characterized in part by its tone. I call these TAM tone markers. I have so far shown that the TAM tone marker for the gerund and perfective stems is a high tone, and that the

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[7]With the exception of the gerund forms, verb stems when cited in isolation in this paper cannot exist as words. However, perfective and imperfective stems rest invariable when concatenated with prefixes.

[8]The difference between noun stems and verb stems in this regard is that, exceptionally, segments in noun stems may be lexically linked. Examples are *aná-sɔngɔɗɔmíɔ* 'scorpion' and *gbuᵑᵍgbukítí* 'circumcision dance', where there is no way of predicting the penultimate H association. However, the usual case for noun stems is that they have lexical melodies that link by the UAC and rules such as H retrolinking (3).

TAM tone marker for the imperfective is a low tone. I summarize these informally in (8) and give examples in (9).

(8) TAM tone markers

[perfective] --> H
[gerund] --> H
[imperfective] --> L

(9) TAM tone markers with resultant melodies for *béɗá* (class I) and *ʄɔngá* (class II)

Verb-stem/TAM marker	perfective (H)	imperfective (L)
class I (L):	ʄɔngí (LH)	ʄɔnga (LL)
class II (H):	béɗí (HH)	béɗa (HL)

2.2.2 Stem class Ia and the feature [branching]

There is a sub-class of verb stems which, when conflated with the perfective TAM, surface with a rising tone on the first syllable.

(10) Stem class Ia (exhaustive)[9]

Imperfective	Perfective	Gloss
betua	*bětú*	'limp'
ɓota	*ɓǒtí*	'pull'
kambea	*kămbí*	'get up on'
ketia	*kětí*	'transform'
Φasa	*Φăsí*	'urinate'
Φatia	*Φătí*	'shut'
Φɛka	*Φěkí*	'construct'
Φoɗa	*Φǒɗí*	'pass by'
Φongota	*Φǒngótí*	'gouge out eyes'
Φusia	*Φŭsí*	'suspect'
sɔngɛa	*sŏngí*	'thread (tr.)'
tandoa	*tăndú*	'leap from branch to branch'
tongoa	*tŏngú*	'castrate'
tɔmia	*tɔ̆mí*	'recount'

In each case in (10), the first syllable is of one mora. There is no difference in the length of the first syllable in comparing the same stem in each TAM configuration. Nor is there any difference in length between

[9]Alternations in the vowel endings between the perfective and imperfective forms of the stem are discussed in Thomas (to appear).

the first syllables of the minimal pairs *bětú* 'limp:pf' and *betú* 'invert:pf'.

The difference between verb-stem class I and what I am calling here verb-stem class Ia is that two tones can link to the first vowel, creating a rising tone. Archangeli and Pulleyblank (1986) account for such vowels by using the feature [branching]. Informally, [branching] means that two elements on the same tier are linked or will be linked in derivation to the same node, in this case a tonal node. A branching node linked to distinct values of [high] would surface as a diphthong in some language. A branching node linked to two distinct tones (or values of [upper]) here surfaces as a contour tone.

I illustrate with *Φăsá* 'urinate'. Figure (11) is a partial lexical entry for [urinate].

(11) Partial lexical entry for *Φăsá* 'urinate'

Φ a s a	segmental melody
C V C V	skeleton
L	tone melody
branching	other features relevant to tone

The first and second lines in the brackets indicate that the lexeme consists of a CVCV skeleton, of which the second and fourth elements are vowels. The third line describes the tone class of the stem. The fourth line indicates the branching nature of the lexeme with regard to tone.

In the case of concatenation of 'urinate' with a perfective TAM tone, a derivation would look like the following.

(12) Derivation of Φasi 'urinate:pf'[10]

Φasi lexical input
L•

Φasi conflation of perfective TAM tone
L•H•

[10]A circumflex accent [ˆ] below a vowel indicates that it is branching.

```
 Φăsi  UAC
 / \
L   H

 Φăsí  Tone spreading (to be discussed below)
 / \|    (=output)
L   H
```

Now it is a property of Komo roots that, if there is a contour tone present in a root, that contour is usually on the leftmost syllable. Thus, I assume that [branching] associates in the unmarked case to the leftmost vowel in a lexeme, as was assumed in the preceding derivation.

There are, however, three bisyllabic nouns in the data where both syllables have contour tones. There are no verb stems having two contour tones. Here are examples of nouns having one or two syllables with contour tones:

(13) Nouns with contour tones

On one syllable		On two syllables (exhaustive)	
ɓŭku	'wallet'	*kĕkĕ*	'now'
ɓŭkutu	'earwax'	*ΦɔΦɔ*	'plant (ataenidia conferta)'
ĕtɛ	'mona monkey'	*sŏsŏ*	'crabgrass'

The nouns in the right-hand column consist of reduplicated syllables. If reduplication is analyzed to occur after H retrolinking, then there are no exceptions to having the feature [branching] assigned by UAC to the leftmost syllable.

One other exception is *bɛbĕta* 'unripe rice', which may again be the result of a reduplication process, where *bĕta* is the root and leftward reduplication of the first syllable again occurs after H retrolinking, but where the tonal node may not spread leftward (although it evidently can spread rightward in (13). So [branching] is analyzable in Komo as a lexical feature of a noun or verb stem that links by UAC to the leftmost vowel.

2.2.3 Stem class III

Two stems do not follow the pattern of table (9) in a way that can be accounted for with the feature [branching]. These are *já* 'return (intr)' and *gúá* 'fall'. Their perfective and imperfective stems are as follows.

(14) Stem class III[11]

Verb stem/TAM tone	perfective (H)	imperfective (L)
já	*jí*	*ja*
gúá	*gú*	*gua*

In (14) the tone that surfaces on the verb stem seems to depend wholly upon the tone of the TAM marker. Apparently, these two roots are lexically toneless. A derivation would consist of simply linking a TAM tone to a toneless stem, which thereby takes on the tone of its TAM configuration.

Alternatively, one could say that the two stems in question are simply irregular. The problem with the alternative is that the same pattern exists through a number of other TAM configurations: if the TAM tone is H, then the two stems line up with stem class II; if the TAM tone is L, then the two stems line up with stem class I. Truly irregular stems would be expected to line up with stem class I or stem class II with regard to a TAM configuration in an arbitrary manner. The following table summarizes things:

15 TAM configurations

TAM configuration	TAM tone	stem class III lines up with:
imperfective	L	class I
perfective	H	class II
subjunctive	H	class II
gerund	H	class II
future	L	class I
future anterior	L	class I
strong subjunctive	H	class II

The following examples illustrate these stem configurations, which are, left to right, the causatives of the stems *ʄɔngá* 'speak', *bɛ́ɗá* 'take', and *gúá* 'fall'. The Class I or II stem that the class III prefix lines up with in each case is underlined.

[11]Note that the citation forms in the left-hand column are gerunds which take the perfective (high tone) TAM.

(16) TAM configuration examples

TAM	class I	class II	class III
imperfective	*ʄɔngisa*	*bɛ́ɗisa*	*gusa*
perfective	*ʄɔngísí*	*bɛ́ɗísí*	*gúsí*
subjunctive	*ʄɔngísé*	*bɛ́ɗísé*	*gúsé*
gerund	*ʄɔngísá*	*bɛ́ɗísá*	*gúsá*
future	*ʄɔngisände*	*bɛ́ɗisände*	*gusände*
future anterior	*ʄɔngisaéká*	*bɛ́ɗisaéká*	*gusaéká*
strong subjunctive	*ʄɔngísémbɛ*	*bɛ́ɗísémbɛ*	*gúsémbɛ*

2.2.4 Monosyllabic verbs

One case of a monosyllabic verb, *já*, was shown in the preceding section. Since it is lexically toneless, only one tone could be assigned to it: that of the TAM marker. Thus, there is no problem with its derivation.

A problem comes when the lexical tone of a verb stem is distinct from that of the TAM marker. I first discuss verbs with single-syllable imperfective stems, then verbs with single-syllable perfective stems. (I note that the set of verbs with single-syllable imperfective stems is a proper subset of the set of verbs having single-syllable perfective stems but one- or two-syllable imperfective stems. This is a consequence of the lexical shape of the non-tonal part of the perfective and imperfective TAM markers (Thomas, to appear).

An exhaustive list of single-syllable imperfective stems consists of class I *gă* 'go'; class II *ɓá* 'be', *ɗá* 'lie down', *má* 'stand', *sá* 'criticize', *tá* 'hunt with bow and arrow', and *ʄá* 'refuse, fly off'; and class III *já* 'return'. The imperfective of class III *já* is *ja*, as was shown in the preceding section. The imperfective of class I *gá* is *ga*, as would be expected for a low tone stem with a low tone TAM marker. With class II, the citation forms are also the imperfective stems. For example, the imperfective of *ɗá* is *ɗá*: the low tone of the imperfective TAM never surfaces. Apparently, there is no general provision in Komo for linking leftover low tones after applying the UAC.

The situation with single-syllable perfective stems is different. The following table shows the state of affairs.

(17) Single-syllable perfective stems

class	gerund	perfective	imperfective	gloss
I.	*gă*	*gĕ*	*ga*	'go'
	ɓoá	*ɓŭ*	*ɓoa*	'take'
	siá	*sĭ*	*sia*	'brush onto'
II.	*ɗá*	*ɗé*	*ɗá*[12]	'lie down'
	éá	*í*	*éá*	'eat'
III.	*gúá*	*gú*	*gua*	'fall'
	já	*jí*	*ja*	'return'

The situation with class III has already been explained in the preceding section. Class II, with its high tone, presents no problem, since both stem-class tone and TAM tone are the same. Class I presents a problem because the number of tones assigned by lexicon and by the TAM tone marker exceed the number of syllables in the verb stem. This is accounted for in a way similar to that of monosyllabic nouns: H retrolinking applies, creating a rising contour tone. The difference between monosyllabic nouns with two lexical tones and monosyllabic verb stems is that the extra tone is created by conflation of a TAM tone marker, and not directly from lexical insertion of tone onto the base form.

2.2.5 Summary

There are thus three tone classes for Komo stems and one subclass. I summarize in the table below.

(18) Komo verb-stem tone classes (two-syllable stems) and their usual surface realizations[13]

class	tone	branching?	pf melody	impf melody
I.	L	no	LH	LL
Ia.	L	yes	RH	LL
II.	H	no	HH	HL
III.	none	no	HH	LL

[12] *ɗá* contains a high tone only, because only high tones may retrolink. *éá* contains two high tones because of a post-lexical rule of tonal node spreading. These are discussed in more detail below.

[13] For an exception to the column on imperfective melodies, see section 3.3.

3 Tone in the derivational stratum

3.1 Derived stems

Derived stems behave in much the same way as the root from which they are formed. By far the most common and productive derivational suffixes include the causative, (*-is/-us/-es*), the applicative (*-e/-ɛ/-i*), the reciprocal (*-an*), and the habitual (-gV), where V is any vowel.[14]

(19) Derived stems

verb stem pf	impf	gloss
class I (*ʄɔngá* 'speak')		
ʄɔngéá *ʄɔngéí*	*ʄɔngɛa*	'accuse' (appl)
ʄɔngésá *ʄɔngésí*	*ʄɔngɛsa*	'cause to accuse' (appl:cs)
ʄɔngágá *ʄɔngígí*	*ʄɔngaga*	'discuss' (hab)
ʄɔngánéá *ʄɔngánéí*	*ʄɔnganea*	'accuse each other' (recip:appl)
class Ia (*tɔ̃míá* 'narrate')		
tɔ̃mííá *tɔ̃míí*	*tɔmiia*	'narrate for [someone]' (appl)
tɔ̃mísá *tɔ̃mísí*	*tɔmisa*	'cause to narrate' (cs)
tɔ̃míágá *tɔ̃mígí*	*tɔmiaga*	'narrate' (hab)
tɔ̃míáná *tɔ̃miání*	*tɔmiana*	'swap stories' (recip)
class II (*bɛ́ɗá* 'take')		
bɛ́ɗɛ́á *bɛ́ɗɛ́í*	*bɛ́ɗɛa*	'work with' (appl)
bɛ́ɗísá *bɛ́ɗísí*	*bɛ́ɗisa*	'cause to work' (cs)
bɛ́ɗánéá *bɛ́ɗánéí*	*bɛ́ɗanea*	'work for' (recip:appl)
bɛ́ɗánágá *bɛ́ɗánígí*	*bɛ́ɗanaga*	'work' (recip:hab)
class III (*já* 'return')		
jíá *jíí*	*jia*	'relapse' (appl)
jígá *jígí*	*jiga*	'remain' (hab)
jísá *jísí*	*jisa*	'return something' (cs)
jísíá *jísíí*	*jisia*	'return something for' (cs:appl)
jíságá *jísígí*	*jisaga*	'return something' (cs:hab)

[14] See Thomas (to appear) for formal statements of the lexical content of these derivational suffixes.

So, neither the verb root by itself nor the verb when concatenated with any derivational suffixes has any effect on the tone of the first syllable in perfective and imperfective TAM configurations. Class III is especially interesting here. Not only is the root toneless, but none of the three derivational suffixes attested as collocating with the root have any effect on the tone of the first syllable in the perfective and imperfective. I conclude that derivational suffixes as well as class III stems are lexically toneless.

Of course, the problem remains about accounting for what happens when the two tones associated with the verb-stem tone class and the TAM tone marker must associate with a stem of three or more syllables. Again, the UAC as stated in its more recent formulations does not deal with cases where there are either excess autosegments or excess syllables after association of autosegments to syllables. Such residue must be dealt with by language-particular rules.

The case where there are excess high tones after UAC, was dealt with by rule (3). Here, where there are more syllables than tones available to link to them, two rules are needed to account for the data, a rule of default L insertion and its complement rule of H spreading.[15]

---

[15]One might propose a rule that spreads any tone, L or H. I'll call it tone-node spreading. There are two motivations for a default L rule.

(1) Default L can be independently motivated. All noun class prefixes (Thomas, in preparation) and verb person prefixes are low toned in the absence of additional overlaying morphemes. I therefore assume that all such prefixes are lexically toneless and subject to a default L rule. So, default L is useful outside of the stratum where stems are derived. There is no context that I am aware of where tone spreading would apply outside of stem derivation.

(2) Default L is slightly simpler. Tonal node spreading involves the insertion of structure, whereas default L inserts content. Here is a comparison of the two rules showing tonal node spreading to be more marked than default L:

Tonal node spreading	Default L
I. c. structure	
II. tonal node	II. [-upper]

(20) Default L insertion

II. [-upper]

Graphically: V --> V
L•

(--> V) by UAC
(L)

In prose: this says that the content of a low tone is inserted wherever there is a free anchor.

(21) H spreading

I. c. structure
II. [+upper]

Graphically: V V --> V V
| |/
H H

In prose: structure is inserted between a (linked) high tone and a (free) anchor on its right.

A problem arises if the lexical tone and a low TAM tone are sequentially concatenated to a class II stem. H spreading could apply before TAM tone is assigned, yielding a wrong result. Therefore, lexical tone and TAM tone must be applied simultaneously to the root. Here is a derivation:

(22) Derivation of *bɛ́ɗánígí* 'take:impf:recip:hab'

bɛɗa H•L•	input (including lexical and TAM tone)
bɛ́ɗa H L	UAC (H spreading cannot apply)
bɛ́ɗana H L	reciprocal
bɛ́ɗana H L L•	default L insertion (20)
bɛ́ɗana H L/	resolution of OCP (Archangeli and Pulleyblank 1986:136ff)
bɛ́ɗanaga H L/	habitual

bédanaga default L insertion, resolution of OCP,
H L/ / output

A derivation of a class III stem is straightforward. A TAM tone is assigned and spread through the stem.

(23) Derivation of (class III) jísígí 'return:cs:hab:pf', ignoring derivation of the TAM theme vowel[16]

ji lexical input (with perfective theme vowel)
H•

jí UAC
H

jísi causative
H

jísí H spreading (21)
H/

jísígi habitual
H/

jísígí H spreading (=output)
H/ /

3.2 Nuance #1: class I single-syllable stems and their derivatives

There are two nuances in the data presented thus far. The first concerns class I stems having single-syllable perfectives. The stems *biá* 'fell a tree', *gă* 'go', *geá* 'say' and *kiá* 'descend from' are examples. Their imperfectives are *bĭ*, *gĕ*, *gĭ*, and *kĭ*.

It turns out that all such stems seem to behave like class Ia stems when a derivational suffix is added. Thus, the causative derivatives of the forms cited in the previous paragraph are *bĭsí*, *gĕsí*, *gĭsí*, and *kĭsí*. Now their resemblance to class Ia stems is illusory. Ordering TAM tone insertion before derivational affixation brings about the rising contour on the first syllable of such forms without needing recourse to the feature [branching]. Here is a derivation:

---

[16]Each TAM configuration has a theme vowel which is found on the last vowel of the verb stem and on the vowel preceding the habitual *-g*. See Thomas (to appear) for details.

(24) Partial derivation of *kĭsí* 'descend:cs:pf'

ki L˙H˙	input (ignoring vowel behavior)
ki | L H˙	UAC
kĭ |\ L H	H retrolinking (3)
kĭsi |\ L H	causative
kĭsí |\\| L H	H spreading (21) (output)

I should note that the class of such verbs is a small one, containing 13 members, of which I here give an exhaustive list. (I use the causative suffix because it is productive for the whole set. Other derivatives are possible, and the same results would be obtained with respect to tone on the first syllable.)

(25) Class Ia verbs with single-syllable perfectives (exhaustive)

citation	pf	pf:cs	gloss
ɓoá	*ɓŭ*	*ɓŭsí*	'take'
biá	*bĭ*	*bĭsí*	'fell'
ɗoá	*ɗŭ*	*ɗŭsí*	'dress hair'
doá	*dŭ*	*dŭsí*	'pound'
gă	*gĕ*	*gĕsí*	'go'
geá	*gĭ*	*gĭsí*	'say, do'
kiá	*kĭ*	*kĭsí*	'descend'
kpuá	*kpŭ*	*kpŭsí*	'invert'
ndiá	*ndĭ*	*ndĭsí*	'dive'
Φuá	*Φŭ*	*Φŭsí*	'sweep'
siá	*sĭ*	*sĭsí*	'brush on'
soá	*sŭ*	*sŭsí*	'give enema'
tiá	*tĭ*	*tĭsí*	'rub'

3.3 Nuance #2: Localized tone spreading

I examine some single-syllable stem class II verbs when conflated with the imperfective TAM tone.

(26) Single-syllable stem class II verbs in the imperfective

citation	impf		gloss
éá	*éá*	**éa*	'eat'
éágá	*éága*	**éaga*	'eat:hab'
tóá	*tóá*	**tóa*	'move'
tóísá	*tóísa*	**tóisa*	'cause to move:cs'

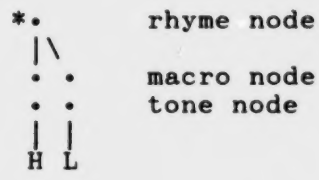
Apparently a constraint is at work here: a low tone and a high tone can be associated to two immediately adjacent vowels only in that order. With such a constraint in operation, the UAC cannot apply in a one-to-one fashion: it must skip over the second vowel if the first vowel is not separated from it by a consonant. In such a case, H spreading then applies, linking high tones to the second vowels of such stems.

I formalize as follows:

(27) Rhymes may not license (cf. Goldsmith 1990:104ff) an HL melody.

The idea here is that two immediately adjacent vowels could be analyzed to be dominated by the same rhyme, the first vowel being a nucleus, the second a coda. If an HL melody could not be licensed to a single rhyme node, then the only repair strategy available to the language would be to allow high tone spreading to the second vowel.[17]

(28) Diagram of (27)



[17]It is also interesting to note that there is no stem class IIa where there are falling contours on the first syllable of the imperfective stem in a manner symmetric with the rising contours found in stem class Ia. (27) is consistent with this observation.

(29) Derivation fragment of *tóísa* 'move:cs:impf'[18]

toi H•L•	input
tói H L•	UAC (floating L cannot link)
tó í H/L•	H spreading (21)
tó ísa H/L•	causative
tó ísa |/ | H L	UAC
tóísa	output

[18]Alternative analyses are possible. One is to posit a rule of L delinking, as shown in the following derivation fragment of 'cause to move:cs:impf':

toi H•L•	input
tói HL	UAC
tói H	L deletion
tóí H/	H spreading
tóísa H/ L•	default L
tóísa H/ L	UAC
tóísa	output

The preceding derivation involves one more step, and appeals to two more rules (default L and L deletion) than that involving a constraint against HL sequences on immediately adjacent vowels, as seen in the main text. Furthermore, adding an L in the derivation then deleting it seems less elegant than having a constraint handy to bar the application of default L in the first place.

3.4 Digression: tone-bearing units

In the discussion so far, I have assumed that only vowels are tone-bearing units. In fact, not only vowels, but also nasals can bear tone in Komo. This is most evident in the rare cases where nasals bear high tones. Here is a nearly exhaustive list: *ḿa* 'mother (infantile)', *ḿbé* [animate, near demonstrative pronoun], *ḿbɔ́* [animate, far demonstrative pronoun], *ńa-* [allophone of the 3s subject prefix when concatenated before an imperfective stem], *ńdé* [inanimate, near demonstrative pronoun], and *ńdɔ́* [inanimate, far demonstrative pronoun], *ńgbe* 'whistle', *ńsa* 'fire, firewood'.[19]

Nasals can also be assigned default L tone. Such is the case in nouns having an initial nasal immediately followed by a voiceless obstruent: they always surface with an overt low tone. This can be demonstrated by having a Komo speaker pronounce a word, then whistle its tone melody. In the following table, word-initial nasals preceding a voiceless obstruent receive a whistled tone, while those preceding a voiced obstruent do not.

(30) Word initial nasals: whistle test

word	whistled melody	gloss
Before voiced obstruents:		
mbángɔ	HL	'quickly'
ndíu	HL	'however'
njóki	HL	'bee'
ngɔ́mú	HH	'only child'
ngbángbá	HH	'shelter'
Before voiceless obstruents:		
mpáti	LHL	'game track'
mΦáse	LHL	'twin'
ntíndí	LHH	'civet cat'
nsungú	LLH	'manioc'
ncánjá	LHH	'side'

[19]There is diachronic evidence as to why *ḿa* and *ńa-* do not violate (27). In related languages such as eBhele, such words begin with an [í], yielding *íma* and *ína*. Apparently, the autosegmental content of the initial [i]s were diachronically deleted, leaving rhyme nodes to which the initial nasals were reassigned in the lexicon. Since (27) concerns unique rhyme nodes dominating HL sequences, not two rhyme nodes, the constraint is not violated.

nkeke	LLL	'skin'
nkpángbá	LHH	'riverbank'

The problem of how the nasals in the second set of examples may bear tone is resolved by having recourse again to Goldsmith's (1990) notion of licensing.

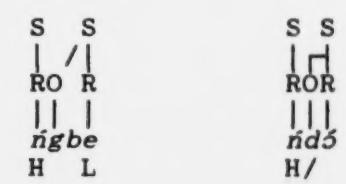
(31) An onset may license only one value each of [voiced] and [implosive].

Since a nasal is [+voiced] and [-implosive], it follows that, if it is adjacent to an obstruent, then that obstruent must also be [+voiced] and [-implosive] in order for the nasal to be dominated by the onset that dominates the obstruent.

I assume that, if an initial nasal is not part of the first onset of a word, then it is dominated by a rhyme and can bear tone. If I further assume, on diachronic grounds, that such nasals are noun class prefixes (cf. Thomas, in preparation), then default L can apply to such nasals, yielding the results of (30).

How, then, would tone-bearing nasal plus voiced, non-implosive obstruent clusters as in *ńgbe* 'whistle' and *ńdɔ́* [inanimate, far demonstrative] be handled? (Both are given two tones when subjected to the whistle test.) I assume that such words are exceptionally assigned two rhymes (or two syllables) each in the lexicon, as well as an HL melody for *ńgbe*, and an H melody (that spreads) for *ńdɔ́*. An appropriate linking strategy then derives the following.

(32) Representations of *ńgbe* and *ńdɔ́* (R = rhyme, O = onset, S = syllable)



A last problem concerns the following:

(33) Word medial nasal plus voiceless obstruent clusters[20]

ɓá-ń-tekí	*a-n-tekí*
3p-3s-send:pf	3s-3s-send:pf
'they sent 3s'	'3s sent 3s'
ɓá-ń-téní	*a-n-téní*
3p-3s-cut:pf	3s-3s-cut:pf
'they cut 3s'	'3s cut 3s'

In such cases, the nasal in effect assimilates in tone to the adjacent vowel, despite the fact that the third person singular object lexeme contains an autosegmental low tone (see section 4.2.1). Given the constraints (27) and (31), the following sequence results.

i) Onsets may only license one value of [voiced] and [implosive]. The constraint implies that the nasals are not part of onsets, and therefore must be tone-bearing codas.

ii) Rhymes may not license HL melodies. The constraint prevents the autosegmental L of the object lexeme from linking to the nasal if the adjacent vowel is linked to a high tone.

iii) High tone spreading then takes place if the adjacent vowel is linked to a high tone. The autosegmental L associates otherwise, then undergoes OCP-motivated repair to yield a branching L that is linked to both the vowel and the nasal.

The result is HH or LL surface melodies as in (33).

4 Tone in inflectional prefixes

So far I have only exhibited tonal behavior in the verb stem. The only rules operating were those of Default L and its complement of H spread. In this section, a new tone process is described: dissimilation. This rule is then shown to interact in interesting ways with the morphology.

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[20]A similar tonal paradigm could be obtained with nasal plus voiced implosive clusters, e.g. by substituting *ɓī* 'chase:perfective stem' and *ɓéí* 'hate:perfective stem'.

4.1 Derivation of subject prefixes

4.1.1 Positive subject prefixes and their toneless nature

Positive subject prefixes normally have a low tone, with the exception of the third person plural, which normally has a high tone. In the following tables, I first show the paradigm with all possible allomorphs, then illustrate with the perfective and present continuous TAM configurations.

(34) Subject prefixes[21]

1s: *ne-/nɛ-/ni-*	1p: *ɓe-/ɓɛ-/ɓi-*
2s: *o-/ɔ-/u-*	2p: *ɓo-/ɓɔ-/ɓu-*
3s: *a-*	3p: *ɓá-*

(35) Perfective of *gbagá* 'be difficult'

1s: *ne-gbagí*	1p: *ɓe-gbagí*
2s: *o-gbagí*	2p: *ɓo-gbagí*
3s: *a-gbagí*	3p: *ɓá-gbagí*

The present continuous TAM configuration consists of a subject prefix, a low tone participle formative *o-/ɔ-/u-*, and a verb stem configured in the imperfective.

(36) Present continuous (*abá* 'chat')

1s: *ne-o-aba*	1p: *ɓe-o-aba*
2s: *o-o-aba*	2p: *ɓo-o-aba*
3s: *a-o-aba*	3p: *ɓá-o-aba*[22]

The 3p prefix is the reflex of the Bantu class 2 concord marker. It takes a high tone when preceding a verb

[21]In this table I show all the possible allomorphs in order of their frequency of appearance. They agree in ATR with the stem, and in height with the initial stem vowel if there is no consonant preceding that vowel and if there is agreement in backness. For details, see Thomas (to appear). Since I am most concerned with tone here, I do not always show all possible allomorphs of other subject or object configurations in other tables below.

[22]Note that the HL constraint (27) does not apply to this form. This is because [áo] in *ɓáoaba* are linked to separate rhymes. In fact, there is an empty onset before the participle formative *o-* that can host a locative adverbial *k-*, as in *ɓâkoaba* 'and s/he preached there'. In closely related eBhele, on the other hand, the participle formative is *lo-*.

and a low tone when preceding a noun. A concrete nominalization is a noun identical to a 3p perfective except that the concord marker takes a low tone instead of a high tone and the TAM tone is a low tone instead of a perfective high tone.

(37) The class II concord marker, comparison of its tonal alternation in verbal and nominalization contexts

class I:

ɓa-Φangigi	'teachers (*Φangíágá* 'to teach)'
ɓá-Φangígí	'they have taught'

class Ia:

ɓa-Φcki	'builder' (*Φčká* 'build')
ɓá-Φčkí	'they have built'

class II:

ɓa-béɗanigi	'worker' (*béɗánágá* 'work')
ɓá-béɗánígí	'they have worked'

class III:

ɓa-gui	'divers' (*gúíá* 'dive')
ɓá-gúí	'they have dived'

Because the tone of the class 2 concord marker prefix can vary like this, I assume that it is lexically toneless, and that the high tone assigned to it in a verbal context is assigned by a lexically conditioned rule:

(38) Third person plural subject tone (derivational stratum)[23]

II. [+upper]
III. trigger: [3p subject:verb]
target: (free)

---

[23]I take it that *derivation* is taking place when a prefix is being derived, and that *inflection* is taking place when that prefix is concatenated with a verb stem or with another prefix.

My motivation for this analysis is that *ɓa-* is diachronically the Bantu class 2 (human plural) concord marker, which is prefixed to both verbs and nouns. Whether or not the concord prefix gets a high tone depends upon whether it precedes a noun or a verb.

That is, a high tone is inserted where there is a third person plural subject prefix in the context of a verb.

The other subject prefixes may take a high tone in the narrative tense, which consists of a person prefix, a participle formative *o-/ɔ-/u-*, and the verb stem configured in the imperfective with a low tone TAM marker.

(39) Narrative tense (*gogá* 'pound')

1s: *né-o-goga*	1p: *ɓé-o-goga*
2s: *ó-o-goga*	2p: *ɓó-o-goga*
3s: *á-o-goga*	3p: *ɓá-o-goga*

I take it that the high tone on the subject prefixes are assigned then by a lexically conditioned rule.

(40) Narrative high tone insertion (derivational stratum)

II. [+upper]
III. trigger: [narrative]
target: (free)

There are other cases of a high tone occurring on the subject prefix coming up below. I included the case of the narrative tense here in order to make the point that subject prefixes are toneless. They are either assigned a high tone as in (38) and (40), or are assigned a low tone by default rule (20).

This then makes three classes of morphemes in Komo that are toneless: class III verb stems, derivational suffixes, and positive subject prefixes.

4.1.2 Negative subject prefixes

Another set of subject prefixes occur in a negated clause. I simply call these 'negative subject prefixes'.[24] The negative subject prefixes usually have a high tone, as in the following tables.

(41) Negative subject prefixes

1s: *ké-/ké-/kí-*	1p: *ɓéké-/ɓéké-/ɓékí-*
2s: *kó-/kɔ́-/kú-*	2p: *ɓókó-/ɓɔ́kɔ́-/ɓókú-*
3s: impf: *ńa-/else: ká-*	3p: impf: *ɓána-/else: ɓáká-*

[24]In Thomas (to appear), such prefixes are shown to be derivable from their non-negative counterparts. In that paper, I refer to these prefixes as 'inflectional morpheme complexes'.

(42) Perfective negative (*biká* 'come')

1s:	*ké-bikí*	1p:	*ɓéké-bikí*
2s:	*kó-bikí*	2p:	*ɓókó-bikí*
3s:	*ká-bikí*	3p:	*ɓáká-bikí*

(43) Imperfective Negative (*úbá* 'know')[25]

1s:	*ké-u-úba*	1p:	*ɓéké-u-úba*
2s:	*kú-u-úba*	2p:	*ɓókú-u-úba*
3s:	*ńa-u-úba*	3p:	*ɓána-u-úba*

It is shown below in the section on the subjunctive that the final syllable of the negative subject prefix can have a low tone. Therefore, I extend the previous generalization about subject prefixes to negative subject prefixes: all subject prefixes are lexically toneless. This leads to a rule that assigns a high tone to a negative subject prefix.

(44) Negative tone (derivational stratum)

II. [+upper]
III. trigger: [neg]
target: (free)

That is, a high tone is inserted in the context of a negative morpheme.

I further illustrate with the derivation of a subject prefix.

(45) Derivation of *ɓéké-* '1p:neg-'

[ɓeke]$_{neg}$ input

[ɓeke]$_{neg}$ negative tone (44)
H

[ɓéke]$_{neg}$ UAC
H

---

[25]As with the other tenses that use the imperfective TAM stem configuration, this one makes use of the participle formative. Also note the suppletive forms of the third person subject prefixes. I do not discuss them further here, except to note that the tone-bearing nasal is probably the diachronic result of the [i] dropping from an original *ína-*.

[ɓéké]$_{neg}$ H spreading (21)
H/ (output to next stratum)

4.2 Derivation of object prefixes and the participle formative

4.2.1 Third person singular and noun-class 1 prefix

The third person singular object and noun-class 1 prefix includes a nasal and a lexically prelinked low tone. When prefixed before a class II high tone stem, the prefix acts to create a rising contour on the vowel instead of a flat high tone.[26]

(46) Third person singular object and noun-class 1 prefix

As an object prefix:

Class I stem (*úbá* 'know', *éká* 'trap'):

a-moΦí	*a-nɛsí*
3s-3s:give:pf	3s-3s:tire:cs:pf
'I gave him/her'	's/he tired him/her'

Class II stem:

ɓá-mŭbí	*ɓá-nĕkí*
3s-3s:give:pf	3s-3s:trap:pf
'they know him/her'	'they trapped it'

---

[26]In many Bantu languages, what are called noun class prefixes can be prefixed to both noun and verb stems, in the latter case, as subject or object concord markers. Thus, I refer to a prefix as having different functions depending upon the class of word it is appended to.

Vowel-initial class Ia and III verb stems are not attested.

More detailed morpheme cuts are not given because of evidence that vowel features of a derivational morpheme do not necessarily link up to that morpheme's lexically assigned skeletal positions.

For an analysis of the *m-/n-* alternation in the third person singular object prefix, see Thomas (to appear).

As a noun class prefix:

Class I stem (*ɔΦáná* 'call', *eɓágá* 'set nets'):

mɔΦani	*neɓigi*
cl.1:call:pf	cl.1-set:net:hab:pf
'call'	'net fisher'

Class II stem (*ɔ́mbá* 'cook (tr)', *éngá* 'help'):

mɔ̃mbanigi	*nĕngi*
cl.1:cook:recip:hab:pf	cl.1:help:pf
'cook'	'helper'

I take this phenomenon to be an instance of depression: the low tone on the object prefix or the class I prefix spreads from the nasal consonant onto the following vowel, as in rule (47). This rule must be sensitive to the morphological context of an object in order to prevent a depressor nasal from triggering downstep in subjunctive forms, as is seen in section 4.5.

(47) High tone depression (inflectional stratum)[27]

I. c. structure
II. [-upper]
III. trigger: [+nasal]

Graphically,

```
N]obj   [V --> N V
         |      /|
L˙       H     L H
```

For example,

```
n éngi        input after UAC and inflection
L˙H  L

n ĕngi        high tone depression (47)
|/|  |        (= output)
L H  L
```

---

[27]This rule does not interact with any other rule. It is thus hard to determine in what stratum it takes place, whether in the inflectional stratum or in the post-lexical stratum. I assume that the rule takes place as an inflectional process in keeping with when the prefix is concatenated to the stem.

That is, structure is inserted from a low tone linked from a nasal to a vowel that dominates a high tone. A rising contour surfaces.

There is a feature about the statement of (47) that has not come up so far: both trigger and target must be linked. This is a consequence of both [-upper] and [+upper] being referred to by the rule; the redundancy rule ordering constraint must then have applied, requiring that default tones be assigned to each vowel tone-bearing unit left over after applying the UAC and H spreading (Archangeli and Pulleyblank 1986:15,123-124).

4.2.2 First- and second-person dissimilation.

In the context of a low-tone subject prefix, the first- and second-person object prefixes take the forms shown in the following table.

(48) First- and second-person object prefixes

1s: *mo-/mɔ-/mu-*	1p: *sǒ-/sɔ́-/sú-*
2s: *ko-/kɔ-/ku-*	2p: *nǒ-/nɔ́-/nú-*

(49) Object prefix, perfective (*ɓétá* 'hit')

a-mɔ-ɓétí	*a-sɔ́-ɓétí*
3s-1s-hit:pf	3s-1p-hit:pf
's/he hit me'	's/he hit us'
a-kɔ-ɓétí	*a-nɔ́-ɓétí*
3s-2s-hit:pf	3s-2p-hit:pf
's/he hit you'	's/he hit you:pl'

(50) Object prefix, present continuous

a-ɔ-mɔ-ɓéta	*a-ɔ-sɔ́-ɓéta*
3s-ptp-1s-hit:impf	3s-ptp-1p-hit:impf
's/he's hitting me'	's/he's hitting us'
a-ɔ-kɔ-ɓéta	*a-ɔ-nɔ́-ɓéta*
3s-ptp-2s-hit:impf	3s-ptp-2p-hit:impf
's/he's hitting me'	's/he's hitting us'

It is shown below that the 3s object prefix has a low tone, and that the 3p object prefix has a high tone. Thus, all the plural object prefixes have high tones and all the singular object prefixes have low tones. I therefore propose a rule for object-prefix tone.

(51) Plural object-prefix tone (inflectional stratum)

II. [+upper]
III. trigger: - [plural object]
target: (free)

That is, a high tone is inserted where there is a context of a plural object prefix and a free vowel available to take the high tone. Now this insertion is ordered in the inflectional stratum. This is necessary to permit dissimilation wherever the subject prefix has a high tone, as is now described.

If the subject prefix has a high tone and is adjacent to an object prefix, a first or second person object prefix has a low tone. This is obviously true for singular object prefixes, which have low tones anyway. I illustrate here for the first- and second-person plural object prefixes. In each example that follows, the plural object prefix, which would be expected to have a high tone, instead surfaces with a low tone.

(52) Dissimilation of the high tone in plural object prefixes

ɓá-so-bebí	*ɓáká-so-bebí*
3p-1p-praise:pf	3p:neg-1p-praise:pf
'They praised us.'	'They didn't praise us.'
ɓá-no-bebí	*ɓáká-no-bebí*
3p-2p-praise:pf	3p:neg-2p-praise:pf
'They praised you.'	'They didn't praise you.'

So, a mechanism is needed to account for dissimilation with first- and second-person plural object prefixes. What is proposed here is that L insertion takes place in the inflectional stratum before object-prefix tone insertion takes place.

(53) L after H (inflectional stratum)

II. [-upper]

III. $\begin{matrix} V \\ | \\ H \end{matrix} \;]\,][\,[\, C\ V \;\; \underline{\quad} \;\;]_{object}$

Graphically,

```
V][C V]obj -->  V][C V]obj by the rule
|                   |
H                   H    L•

               -->  V][C V]          UAC
                    |   |
                    H   L
```

The restriction of targets to object prefixes prevents dissimilation occurring on a verb stem whose initial vowel is linked to a high tone.

A derivation would look like this:

(54) Derivation of *ɓákásobebí* 'they didn't praise us'

Derivational stratum:

[3p:neg] [praise:pf]	input from the lexicon
[ɓaka] [so] [bebi] L•H•	lexical insertion of tone
[ɓaka] [so] [bebí] L H	UAC
[ɓaka] [so] [bebí] H• L H	lexically conditioned H insertion rules (38) or (44)[28]
[ɓáká] [so] [bebí] H L H	UAC
[ɓáká] [so] [bebí] H/ L H	H spreading

Inflectional stratum:

[[ɓáká][so][bebí]] H/ L H	concatenation
[[ɓáká][so][bebí]] H/ L L H	L after H (53)

[28]There is no crucial ordering relationship between plural subject and negative H insertion. Only one can operate, however, because of the OCP.

[ɓákásobebí] BE, resolution of OCP, output
|/ |/ |
H L H

Thus, dissimilation is accomplished by putting lexical insertion into the same stratum as an L-insertion rule and ordering the L insertion before morphological high-tone insertion. Object high-tone insertion does not take place because the rule is disjunctive with L insertion. That is, the target conditions for plural object H-tone insertion (51) are a proper subset of the target conditions for L insertion (53).

Also, default L cannot apply to the object prefix in the preceding derivation because it is a more general rule, which is in disjunction with both object high-tone insertion and H spreading. Either would be expected to apply before default L, depending upon how one interprets the OCP.

4.2.3 Third person plural, the participle formative

The third-person-plural object prefix is also discussed in Thomas (to appear). It consists of the feature [-low] and a high tone. However, it has no skeletal content. The behavior of the third-person-plural high tone is shown in the table below.[29]

(55) 3p object (*ɓétá* 'hit', *ngoɗéá* 'tell')

Perfective:

1s:3p	*nĕ-ɓétí*	1p:3p	*ɓĕ-ɓétí*	'I/we hit them'
2s:3p	*ŏ-ɓétí*	2p:3p	*ɓŏ-ɓétí*	'you hit them'
3s:3p	*ĕ-ɓétí*	3p:3p	*ɓé-ɓétí*	'she/he/they hit them'
1s:3p	*nĕ-ngoɗí*	1p:3p	*ɓĕ-ngoɗí*	'I/we told them'
2s:3p	*ŏ-ngoɗí*	2p:3p	*ɓŏ-ngoɗí*	'you told them'
3s:3p	*ĕ-ngodí*	3p:3p	*ɓé-ngoɗí*	'she/he/they told them'

Imperfective

1s:3p	*nɛ-ɔ́-ɓéta*	1p:3p	*ɓɛ-ɔ́-ɓéta*	'I/we are hitting them'

[29]Note that the third-person-plural object prefix contains an autosegmental [-low]. This results in the vowel quality alternation seen where third-person-plural object prefixes are conflated onto third-person subject prefixes. This is discussed more fully in Thomas (to appear).

2s:3p	*ɔ-ɔ́-ɓéta*	2p:3p	*ɓɔ-ɔ́-ɓéta*	'you are hitting them'
3s:3p	*a-ɔ́-ɓéta*	3p:3p	*ɓá-ɔ̌-ɓéta*	'she/he/they are hitting them'

1s:3p	*ne-ó-ngoɗea*	1p:3p	*ɓe-ó-ngoɗea*	'I/we are telling them'
2s:3p	*o-ó-ngoɗea*	2p:3p	*ɓo-ó-ngoɗea*	'you are telling them'
3s:3p	*a-ó-ngoɗea*	3p:3p	*ɓá-ǒ-ngoɗea*	'she/he/they are telling them'

Narrative

1s:3p	*né-ɔ̌-ɓéta*	1p:3p	*ɓé-ɔ̌-ɓéta*	'and I/we hit them'
2s:3p	*ɔ́-ɔ̌-ɓéta*	2p:3p	*ɓɔ́-ɔ̌-ɓéta*	'and you hit them'
3s:3p	*á-ɔ̌-ɓéta*	3p:3p	*ɓá-ɔ̌-ɓéta*	'and she/he/they hit them'

1s:3p	*né-ǒ-ngoɗea*	1s:3p	*ɓé-ǒ-ngoɗea*	'and I/we told them'
2s:3p	*ó-ǒ-ngoɗea*	2s:3p	*ɓó-ǒ-ngoɗea*	'and you told them'
3s:3p	*á-ǒ-ngoɗea*	3s:3p	*ɓá-ǒ-ngoɗea*	'and she/he/they told them'

The rules change for the 3p object. However, lexical insertion of a high tone for 1p and 2p objects requires a free target. Lexical insertion for the 3p object always occurs, whether the target is free or not. Furthermore, 3p object H-insertion occurs after default L-insertion on both the subject prefix (as is seen in the perfective paradigm) and the participle formative (as is seen in the narrative paradigm). I therefore take it that 3p object H insertion takes place in the inflectional stratum (like the other object prefixes), after default L insertion occurs in the derivational stratum.[30] Thus I can state 3p object H insertion.

(56) 3p object H insertion (inflectional stratum)

[3p object] --> [+upper]

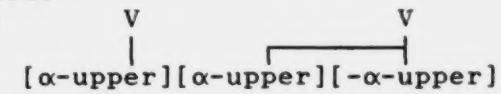
Rules as stated thus far take care of everything except for where a flat, high tone shows up on the participle formative in the imperfective examples above. For this, I propose a post-lexical rule of contour expansion that comes

[30]It also must come after L after H, but this is a result of the OCP, which prevents 3p object H insertion applying except after a low tone.

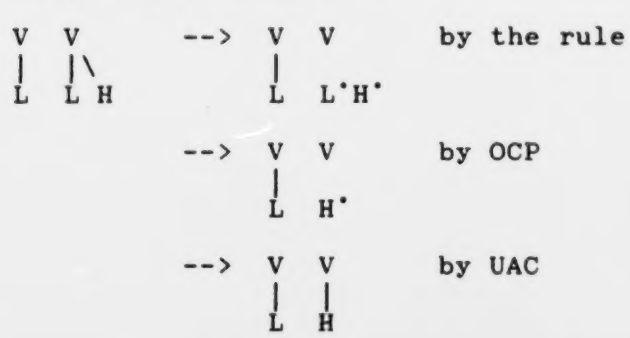
again into play when discussing falling contours late in this paper. What this rule accomplishes is a spread of a contour tone over two vowels where there is either an LR or an HF melody and no intervening consonants. The result is an LH or an HL melody, respectively. (In (57), part I.b. is not specified, being the default parametric value, maximal.)

(57) Contour expansion (inflectional stratum)

I. a. delete
   c. structure
II. tonal node[31]
III. target:



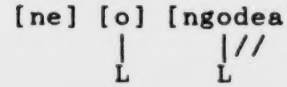
Graphically, where a = -,



A derivation of an imperfective from (55) takes into play most of the rules that are applicable to this set of paradigms.

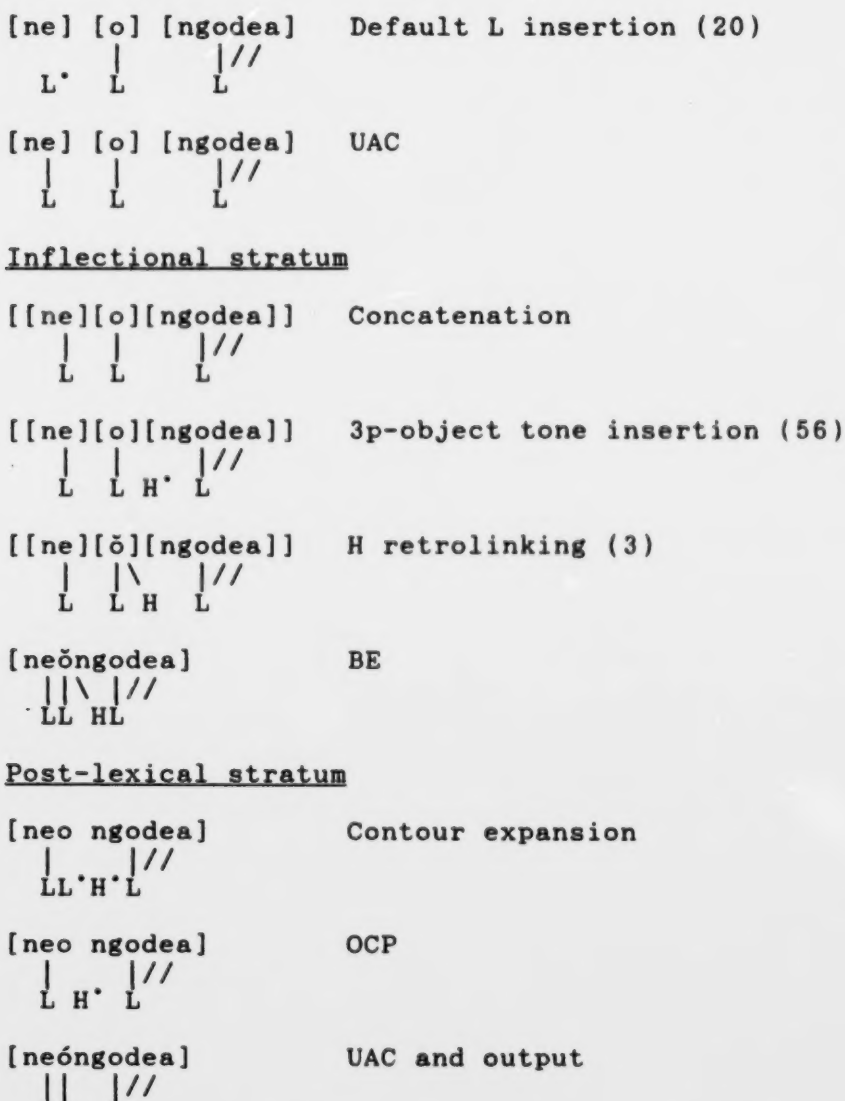
(58) Partial derivation of *neóngodea* 'I am telling them'

Derivational stratum



[31]The reason for deletion of a node and not a feature comes clear in the second discussion of this rule later in the paper.

[32]The participle formative lexeme contains a low tone. This is shown to be necessary for the derivation of imperfective verbs where there is a locative and the subject prefix is high toned. See section 4.4.



4.3 Distant past

The distant past varies in its effect on verb prefixes depending on whether the subject is negative or positive.

If the subject is negative, the distant past is formed simply by adding *dV-*, where the V is the repetition of the first or second person theme vowel [E] or [O] respectively.

(59) Negative distant past

1s:	*ɗéké-/ɗéké-/ɗékí-*	1p:	*ɗéɓéké-/ɗéɓéké-/ɗéɓékí-*
2s:	*ɗókó-/ɗɔ́kɔ́-/ɗókú-*	2p:	*ɗóɓókó-/ɗɔ́ɓɔ́kɔ́-/ɗóɓókú-*
3s:	*ɗáká-*	3p:	*ɗáɓáká-*

Moreover, the distant past has predictable effects on a third-person object prefix, triggering dissimilation.

(60) Negative distant past plus object (*kóndá* 'want')

3s:1p	*ɗákásokóndí*	's/he didn't want us'
3s:2p	*ɗákánokóndí*	's/he didn't want you'
3s:3p	*ɗákékóndí*	's/he didn't want them'

The negative form of the distant past is thus uncomplicated. Very little need be said thus far about the nature of the lexical tone of the distant past.

The positive distant past, however, is a different story. In the following table, an HL melody is pervasive in the plural subject-prefix complexes, including in the third-person plural, which thus far has always had a high tone in verbal (not nominalizing) contexts. Here is the paradigm:

(61) Positive distant past

1s:	*ɗé-/ɗé-/ɗí-*	1p:	*ɗéɓe-/ɗéɓɛ-/ɗéɓi-*
2s:	*ɗó-/ɗɔ́-/ɗú-*	2p:	*ɗóɓo-/ɗɔ́ɓɔ-/ɗóɓu-*
3s:	*ɗá-*	3p:	*ɗáɓa-*

Paradigm with *kóndá* 'want'

1s:	*ɗé-kóndí*	1p:	*ɗéɓe-kóndí*
2s:	*ɗó-kóndí*	2p:	*ɗóɓo-kóndí*
3s:	*ɗá-kóndí*	3p:	*ɗáɓa-kóndí*

The positive distant past also triggers dissimilation in object prefixes that would normally carry a high tone. This is a predicted outcome of the L after H rule (53).

(62) Positive distant past with object prefixes

3s:1p	*ɗásokóndí*	's/he wanted us'
3s:2p	*ɗánokóndí*	's/he wanted you (pl.)'
3s:3p	*ɗékóndí*	's/he wanted them'

Thus, the positive distant past seems to behave in a different manner than the negative distant past, in that the negative form triggers no unusual tonal alternations while

the positive form displays an HL melody wherever there are free syllables available to take an L tone.

For reasons that become clear in section 4.5, on subjunctives, I propose that the high tone be assigned lexically, and that the low tone be assigned by a modification of L after H.

(63) Distant past rules (derivational stratum)

A. Lexical insertion: [dp] --> H

B. L after H (53) modified)

II. [-upper]

III. V ‖ C V ‖ ___ ‖ subject:positive or object
H

Graphically,

V]dp[CV]subject:positive H	-->	V][CV] by the rule H L•
	-->	V][CV] by UAC H L

(64) Derivation of distant past subject prefixes

[dp:2p]	[dp:2p:neg]	
[ɗo][ɓo]	[ɗoɓoko]	Non-tonal part of subject-prefix complexes
[ɗó][ɓo] H	[ɗóɓoko] H	Distant past (63A), UAC
[ɗó][ɓo] H L	--------	Distant past (63B), UAC
------	[ɗóɓókó] H/ /	H spreading (21)
[ɗóɓo]	[ɗóɓókó]	Output to inflectional stratum

What if distant past co-occurs with the participle formative? The participle formative retains a low tone. In fact, except where post-lexical contour expansion is

operating, the participle formative invariably contains a low tone (the surface tone may be a rising tone due to the addition of a third-person-plural object suffix). For this reason, I modify the analysis and propose that the participle formative be lexically assigned an L tone. Here are examples.

(65) Distant past plus participle formative

ɗé-o-kónda	*ɗéɓe-o-kónda*
dp:1s-ptp-want:impf	dp:1p-ptp-want:impf
'I was wanting'	'we were wanting'
ɗéké-o-kónda	*ɗéɓéké-ǒ-kónda*
dp:1s:neg-ptp-want:impf	dp:1p:neg-ptp:3p-want:impf
'I was not wanting'	'we were not wanting them'

If the distant past co-occurs with two person prefixes, L after H still applies if the final tone on the subject prefix is a high tone. There are no surprises. (Note, however, that the bottom left example is ambiguous: third-person plural and unspecified object forms are homophonous because the high tone of the third-person-plural object morpheme is indistinct from the high tone of the distant past.)

(66) Distant past plus two person prefixes

ɗé-ko-kóndí	*ɗéɓe-ko-kóndí*
dp:1s-2s-want:pf	dp:1p-2s-want:pf
'I wanted you'	'we wanted you'
ɗé-no-kóndí	*ɗéɓe-nó-kóndí*
dp:1s-2p-want:pf	dp:1p-2p-want:pf
'I wanted you'	'we wanted you'
ɗé-kóndí	*ɗéɓě-kóndí*
dp:1s(:3p)-want:pf	dp:1p:3p-want:pf
'I wanted (them)'	'we wanted them'

4.4 Locative

It is possible to add a locative *k-* before the participle formative.[33] If the subject prefix is high-toned, then that high tone is depressed.

(67) Locative plus imperfective

a-ko-kónda	*ɓâ-ko-kónda*
3s-loc:ptp-want:impf	3p-loc:ptp-want:impf
's/he is wanting you there'	'they are wanting you there'
â-ko-kónda	*ɗâ-ko-kónda*
nar:3s-loc:ptp-want:impf	dp:3s-loc:ptp-want:impf
'and s/he wanted'	's/he wanted'

â-kŏ-kónda
nar:3s-loc:ptp:3p-want:impf

'and s/he wanted them there'

I analyze the lexeme for the locative *k-* as including the features, but not the skeletal position, for a [k] and an autosegmental low tone. Since in closely related eBhele the participle formative is *lo-*, I suggest that an empty onset is provided by the lexeme for the participle formative to which the locative *k-* can attach.

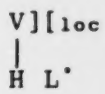
I understand the rule of high-tone depression to be sensitive to the context of the locative, because floating L's with respect to the subjunctive are shown below to trigger rightward downstep and not leftward H depression.

---

[33]If there is no participle formative, then the locative *ko-* is found as a clitic after the verb. Thus, *nenkóndí ko* means 'I want him/her there'.

(68) H depression (inflectional stratum)

I. c. structure
d. opposite direction
II. [-upper]
III. trigger: (free)



(69) Derivational fragment of *nêkoga* 'and I went there'

[ga] L	verb stem formation, output of derivational stratum
[Co][ga] L L	inflectional stratum: participle formation
[Co][ga] k• L•L L	locative
[ko][ga] k L•L L	UAC (L• autosegment cannot link)
koga L•L	BE, OCP
[né][koga] H L•L	subject prefix with narrative H[34]
[nê][koga] H L L	H depression
[nê][koga] H L	OCP
nêkoga	BE, output

[34]The H of the narrative has linked to the subject prefix in the derivational stratum. For clarity in the derivation, I have omitted this part of the derivation.

4.5 Subjunctive

The Komo subjunctive is the only TAM configuration where the tone of inflectional prefixes can have an effect on the tone of the stem. In its positive form, it is characterized by a high tone occurring on the subject prefix with a full downstep to low tone occurring on the verb stem.

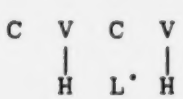
(70) Subjunctive, positive forms (*bísá* 'put', *bebá* 'praise')

1s:	*nébisɛ*	*nébebé*
1p:	*ɓébisɛ*	*ɓébebé*
2s:	*óbisɛ*	*óbebé*
2p:	*ɓóbisɛ*	*ɓóbebé*
3s:	*ábisɛ*	*ábebé*
3p:	*ɓábisɛ*	*ɓábebé*

From the forms with *bebá*, I note that the subjunctive stem forms with a high tone. However, from the forms with *bísá*, the subjunctive stem appears to be exhibiting something resembling downstep, except that a low tone instead of a mid tone is derived.

Now downstep is usually accounted for in autosegmental phonology by positing the existence of a floating low tone between two high tones as pictured.

(71) Traditional autosegmental account of downstep



The surface manifestation of the floating low tone is then a downstep. Such would be the case at least at some stage of derivation if the subjunctive TAM morpheme were to consist of the tonal melody HL being conflated onto the verbal prefixes and an H tone linked and spread across the verb stem.[35] In this way, the subjunctive's subject prefix links by UAC to the H, the tonal melody of the stem is derived in a like manner to the perfective and outputs with either an HH or an LH melody. However, a floating L is then left over between the prefix and the stem, which triggers downstep. Downstep is realized in this case as a full step rather than the more customary downstep.

---

[35]The HL melody was proposed by Meeussen (1967) to be the proto-Bantu future negative pre-initial element. It was found by Hedinger (1985) in Akɔɔse, a Bantu language (classification number A.15b, Guthrie 1953) spoken in the Republic of Cameroon.

(72) Traditional analysis of *ábisɛ*

```
á][ b í s é  --> ábisɛ (surface realization)
|    |  /
HL•  H
```

The traditional analysis of downstep, then, is that it is the surface realization of a floating tone. More recently, it has been shown that many apparent instances of downstep can be analyzed as surface manifestations of *linked* features yielding phonological tones with pitch between H and L (Yip 1980, Hyman 1986, Snider to appear).[36] In Komo, downstep not only derives a phonological tone, but that tone is a low tone (i.e., a full downstep) and not some intermediate tone between H and L.

(73) Proposed analysis of full downstep

```
C  V  C  V  -->  C  V  C  V   by a deletion rule
   |     |        |     |
   H  L•  H        H     L
```

I next propose a rule that formalizes the Komo downstep phenomenon displayed above.

(74) Komo downstep (inflectional stratum and post-lexical stratum)[37]

```
 I. a. delete

II. [+upper]

III. [          • ]  tonal node
                |
     [-upper]  ____
```

---

[36]Pulleyblank (1986:44-45), however, shows that there is an authentic downstep in Dschang resulting from the surface realization of a floating L. In such a case, multiple downstep sequences are possible, a phenomenon that does not occur in Komo.

[37]The reason for the brackets becomes clear in the section below on elision.

Graphically,

```
[   V]   -->     V     by the rule[38]
  |
L•  H          L•

         -->   V       by UAC
               |
               L
```

Thus, the rule simply deletes a high tone after a floating L. This L then links to the stem. The result is indistinguishable from any other L, so no intermediate tone is derivable, which is the desired result.

(75) Derivation of *ɓábisɛ* 'they should place'

Derivational stratum:

```
Subject Stem

[ɓa]   [bisɛ]        Lexical input
 H•L•    H•H•

[ɓá]   [bísɛ́]        UAC, resolution of OCP
 HL•     H/
```

Inflectional stratum:

```
[[ɓá][bísɛ́]]        Concatenation of subject and stem
  HL• H/

[[ɓá][bisɛ]]        Komo downstep (74)
  HL•

[[ɓá][bisɛ]]        UAC, default L, resolution of
  H   L/              OCP

[ɓábisɛ]            BE and output
```

The subjunctive presents another interesting problem in its negative paradigm.

---

[38] I assume here that any lines of association left over after the deletion of a feature are automatically erased.

(76) Subjunctive negative (*bísá* 'put', *bebá* 'praise') with surface declarative intonation

1s:	*kebísé*	1p:	*ɓékebísé*
2s:	*kobísé*	2p:	*ɓókobísé*
3s:	*kabísé*	3p:	*ɓákabísé*
1s:	*kebebé*	1p:	*ɓékebebé*
2s:	*kobebé*	2p:	*ɓókobebé*
3s:	*kabebé*	3p:	*ɓákabebé*

In these forms, no downstep takes place on the stem. Instead, all the syllables with negative *k-* take a low tone. This is in contrast to all non-subjunctive forms where syllables with negative *k-* always take a high tone. Furthermore, the first syllable of the plural prefix always takes a high tone. The plurals are easily accounted for with the HL subjunctive melody already proposed, remembering that negative high tone is assigned by a morphologically conditioned rule (44) and not by lexical insertion. UAC simply associates the HL melody to the two object-prefix syllables before negative high-tone insertion can operate. Negative high-tone insertion only applies to free targets; it therefore cannot apply in the subjunctive.

The singular subjunctive negative forms still pose a problem. Apparently, the UAC does not apply; rather the right hand L tone of the HL subjunctive melody links to the negative prefix. I must account for this with an ad hoc rule.

(77) Negative subjunctive tone assignment (derivational stratum)

```
  I.c. structure
    d. opposite direction
 II. [+upper][-upper]
III. - negative
     - subjunctive
```

Graphically, where [ka] is in the context of the negative subjunctive:

```
[ka]      -->   [ka]
H˙L˙              |
                H˙ L
```

I know of no context in which the floating or leftover high tone surfaces in the case of the negative singular subjunctive. However, I stick with my analysis that subjunctive has an HL melody, because of the way it accounts

for the negative plural forms. (A prefixed HL melody is typical of certain Bantu tense-aspect-mood structures (Meeussen 1967, Hedinger 1985).)

(78) Derivation of *kebísé* 'I should not put' and *ɓókobísé* 'you (plural) should not put'

[1s:neg:subj][put:subj] [2p:neg:subj][put:subj]

Derivational stratum:

[ke] [bisɛ] H˙L˙ H˙H˙		[ɓoko] H˙L˙	[bisɛ] H˙H˙	input
[ke] [bisɛ] H˙L H˙H˙		----------		Neg. subj. tone assignment
[ke] [bísé] H˙L H/		[ɓóko] H L	[bísé] H/	UAC, resolution of OCP

Inflectional stratum:

[[ke][bísé]] H˙L H/		[[ɓóko][bísé]] H L H/		concatenation
kebísé]		[ɓókobísé]		BE and output

The HL melody also accounts for subjunctive behavior with object prefixes.

(79) Subjunctive: object prefixes (*ɓétá* 'hit', *ɔ́ká* 'hear', 3s and 3p subjects)

3s:1s	*á-mɔ-ɓété*	3s:1p	*á-sɔ-ɓété*
3s:2s	*á-kɔ-ɓété*	3s:2p	*á-nɔ-ɓété*
3s:3s	*á-m-ɓɛtɛ*	3s:3p	*é-ɓɛtɛ*
3p:1s	*ɓá-mɔ-ɔ́ké*	3s:1p	*ɓá-sɔ-ɔ́ké*
3p:2s	*ɓá-kɔ-ɔ́ké*	3p:2p	*ɓá-nɔ-ɔ́ké*
3p:3s	*ɓá-mɔ̃ké*	3p:3p	*ɓé-ɔkɛ or ɓéɓɔkɛ*[39]

The following observations can be made regarding the preceding table:

i) All the forms with first and second person object prefixes have an invariable HL melody. In the case of the third-person-plural object forms, apparently the high tone of the third-person-plural object is

[39]See Thomas (to appear) for a description of optional 3p object [ɓ] insertion before vowel-initial stems.

combined with that of a high-tone stem by OCP, then undergoes downstep.

ii) In the case of the third person singular prefix before any consonant-initial root, downstep occurs on the stem. If the initial consonant of the root is a voiced eggressive obstruent, then the nasal is part of the onset, the autosegmental low tones of the subjunctive and the object may not link, and downstep may apply. If the initial consonant of the root is either voiceless or implosive, then the HL constraint (28) applies, the H of the subjunctive spreads to the nasal, and the autosegmental L of the subjunctive cannot link until downstep applies.

iii) There is also the case of the vowel-initial stem when concatenated with the third-person-singular object. As shown before for the perfective and imperfective, the nasal acts as a depressor consonant on the first vowel of a class II stem, linking a low tone to it. This low tone then prevents the triggering of downstep.

Not shown is an example of a class I stem such as *bebɛ́* 'praise:subjunctive'. Here, the stem remains invariable when preceded by a third-person-plural object prefix: *ɓébebɛ́* 'they praised (them)'. In this case, no rules are provided whereby the floating L of the subjunctive or the floating H of the third-person-plural object may link to anything.[40]

5 Phonological phrase formation

Up until this stage I have only exhibited the four tones that can result from lexical derivation: H, L, rise, and (rarely) fall. In the post-lexical stratum, new tones appear that result from the concatenation of words and the construction of either declarative of interrogative phrases. These tones include a mid tone, rises to a mid tone, and a distinction between a declarative-final flat low tone and a tone that falls off.

I begin by demonstrating declarative downdrift as it occurs within the verb and contrast it with interrogative intonation. Then I show cases of downstep in the verb phrase, and show where downstep has a distinct surface manifestation in contrast to downdrift. Then, I show how

[40]In fact, the third-person-plural object has no distinct surface realization in the subjunctive where there is only one single-syllable verb prefix. It is always homophonous with the corresponding objectless form.

downstep works in associative and oblique phrases. Finally, I look at instances of falling contours in Komo.

5.1 The verb phrase

5.1.1 Downdrift

Downdrift occurs when two high tones are separated by a low tone, where all three tones are linked to distinct vowels. The result in the case of Komo is a mid tone where the second high tone should be. Also in the case of Komo, downdrift only occurs in declarative phrases.

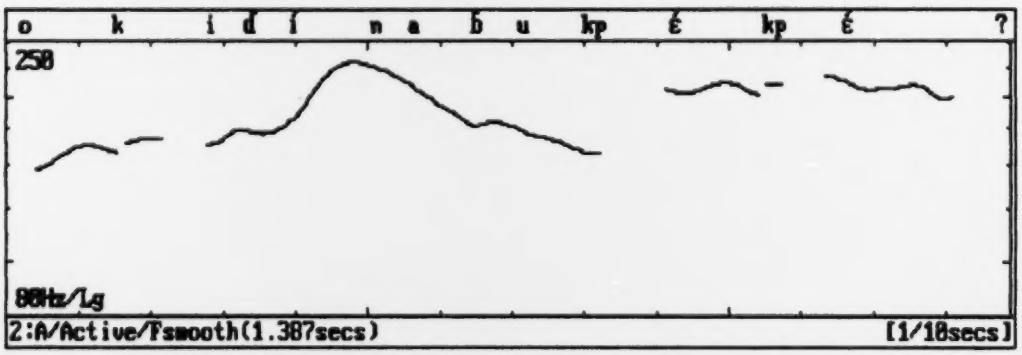
In the next table, the column entitled 'whistled melody' gives the tones whistled by a Komo speaker when asked to say the form under study, then whistle the tonal melody. Note that the middle low tones in the declarative phrase each have a slight trail off or offglide.

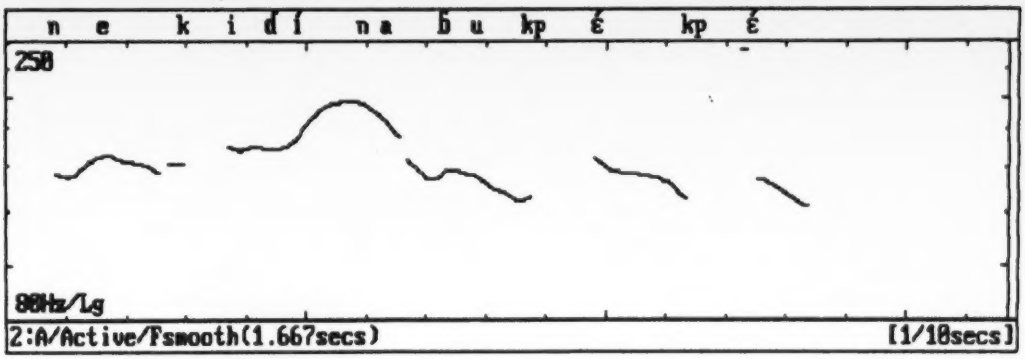
(80) Downdrift (*bɛ́ɗá* 'take')

form	whistled melody	gloss
okiɗí na ɓukpékpé?	[__¯__¯¯]	'Have you come with strength?'
nekiɗí na ɓukpékpé	[__¯__--]	'I have come with strength.'

From the whistle test, clearly the final high tone which did not vary in the interrogative has been downstepped in the declarative. Instrumental analysis using CECIL (SIL 1989) basically confirms the whistle test.

(81) Instrumental analysis of (80)

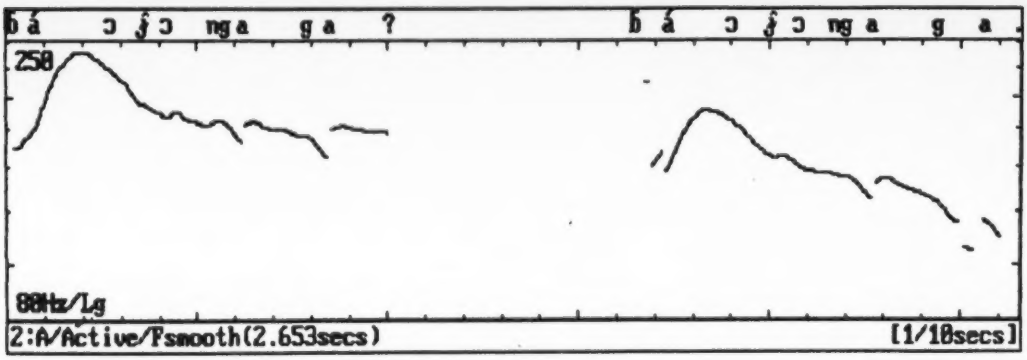




In the instrumental analysis of the declarative phrase, the final high tone looks like the final low tone. A whistler, however, gives the final high tone a higher pitch than the preceding low tone. Also, the high tones both in the interrogative and in the declarative are whistled with flat pitches. The low tones are each given an offglide in the declarative as shown in (80).

In fact, in declaratives, each one in a sequence of final low tones has a rather steep falling contour. The next intonation analysis compares the interrogative and declarative intonations of a phrase having a sequence of final low tones. Note that the low tones on the left-side pattern are relatively level, beginning with the same pitch, whereas the tones in the right-side pattern begin with successively lower tones and have relatively steep offglides. A Komo speaker whistles the relatively flat low tones with flat tones: [__]; he (unfortunately, I had to leave before I could elicit from a 'she') whistles the low tones on the right side of the figure with offglides [__].

(82) Sequence of final low tones in *ɓáɔʃɔngaga* 'they are discussing', interrogative on left, declarative on right[41]



So far, I have shown the existence of four post-lexical level tones. Pulleyblank (1986) and Snider (to appear) take up Yip's (1980) proposal for a hierarchical system of two tonal features, [upper] and [raised] which form four possible combinations, each corresponding to a possible level tone. Thus, Pulleyblank charts these four tones, and I believe that they are realized in Komo as follows:

(83) Tonal feature combinations and Komo realizations

pitch	register	pitch level	Komo realization
+upper	+raised	H	high
	-raised	HM	mid
-upper	+raised	M	flat-low
	-raised	L	flat-low or low offglide

Henceforth in illustrations and derivations, I refer to positive and negative values of [upper] with the uppercase letters H and L, respectively. I refer to positive and

[41]Where two vowels are adjacent without an intervening consonant, a native speaker whistles a high-low sequence as a continuous contour. Unfortunately, I cannot easily represent this in print, and show such contours with two flat tones representing the end points of the contour.

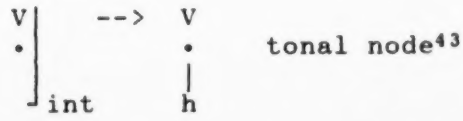
negative values of [raised] with lower case letters h and l, respectively.[42]

Using [upper] and [raised] features to represent Komo surface tone, it becomes possible to account for the phenomena in (80). First, I note that interrogatives have only two tones possible: high and flat-low. I account for this by positing that there is only one value of [raised] used in interrogatives: [+raised]. From this arises a rule:

(84) Interrogative intonation (post-lexical stratum)

II. [+raised]
III. interrogative

Graphically,

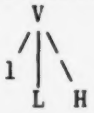


In prose: insert the register feature [+raised] in an interrogative phrase where there is a free vowel.

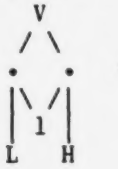
---

[42]This follows the system used in Snider (to appear).

[43]Up until now I have been informal and have not referred to tones as being linked to a vowel via a tonal node. This notation now becomes necessary in post-lexical derivation in order to avoid having to interpret structures representing contour tones such as:



Rather, I represent the preceding rise to mid contour as the linking of two different *tonal* nodes to the same vowel. This then clearly states the two end points of such a contour tone as consisting of a rise from a low tone {L + l} to a mid tone {H + l}:

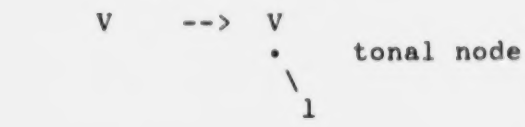


Next, I assign default values for [raised] elsewhere:

(85) Default [raised] (post-lexical stratum)

II. [-raised]

Graphically,

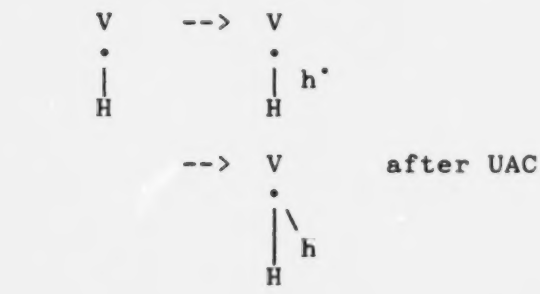


In prose: insert the default feature [-raised] wherever there is a free vowel.

(86) Redundant [raised] (context = H) (post-lexical stratum)

II. [+raised]
III. [+upper]

Graphically,



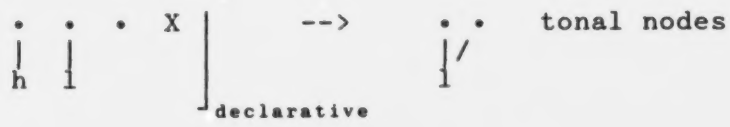
In prose: insert the feature [+raised] to a tonal node to which the feature [+upper] is already linked.

Finally, I arrive at a rule of downdrift. What this rule says is that a [-raised] spreads pervasively through a declarative phrase from its first occurrence after a [+raised].

(87) Downdrift (post-lexical stratum)

I. c. structure
d. (left to right)$_{def}$
II. [-raised]
III. a. declarative final
b. (linked)$_{default}$
c. [+raised] ____

Graphically,



In prose: insert structure from the feature [-raised] occurring after the leftmost feature [+raised] to any vowel on the right. If that vowel is previously linked to [+raised], then that feature is delinked, because (apparently) well-formedness conditions prevent two values of [raised] from being linked to the same tonal node.

Such a rule is disjunctive with both rules of default [raised] (85-86), since it applies to a subset of structures that would trigger the default rules. It therefore must apply exclusively before either default rule.

Note that I made the graphic representation using tonal nodes. This is because the two nodes could be connected to the same vowel. In other words, I am making the prediction that downdrift applies to rising contours as well as to level high tones. This is indeed the case, as shown below, where in a declarative context, the end point of the rising contour becomes a mid tone as a result of downdrift.

(88) Declarative intonation compared with interrogative intonation

[‾ ◡ - _]	[‾ ◡ - _]
ɓá-ǒ-kónda.	*ɓá-ǒ-kónda?*
3p-ptp:3p-want:impf	(same gloss)
'They want them.'	'Do they want them?'

5.1.2 Verb-object downstep

Post-lexical downstep occurs between verb and object in the context of declarative phrases.

(89) Downstep in the verb phrase (*bɛ́ɗá* 'take')[44]

[- - - _ _]	[- - - - -]
ɓá-bɛ́ɗí kasa.	*ɓá-bɛ́ɗí kásá?*
3p-take leaf	3p-take leaf
'They took the paper.'	'They took the paper?'

In order to formalize, I must first note that the high tone undergoing downstep must be the ultimate tone in a declarative phrase. In the examples, different words are put in frames of *ɓákáɓí*...'they looked for [something inanimate]', and *ɓánkáɓí* 'they looked for [something animate]').

(90) Declarative-final downstep

object	gloss	in frame	surface realization
kásá	'paper, leaf'	*ɓákáɓí kasa*	[--- _ _]
jɔ́	'panier'	*ɓákáɓí jɔ*	[--- _]
sékéké	'bird'	*ɓánkáɓí sekeke*	[--- _ _ _]
cíko	'field'	*ɓákáɓí cíkɔ*	[--- - _] *[--- _ _]
kóngóiɓa	'spider'	*ɓánkáɓí kóngóiɓa*	[--- - - _ _] *[--- _ _ _ _]
ɓáumángá	'crocodile'	*ɓánkáɓí ɓáumángá*	[--- - _ - -] *[--- _ _ - -]

Downstep works in the imperfective as well as in the perfective if the final syllable of the verb stem is high, such as is the case with a monosyllabic stem from tonal class II. In the following examples, *tá* is a monosyllabic stem; the low tone of the imperfective cannot associate to the stem. *úá*, though bisyllabic, is subject to the HL constraint (28) and is also a downstep trigger. In the following examples *jɛ́mbá* and *kókó* both have underlying HH melodies.

[44]See the appendix for instrumental data on subjunctive, verb-object, and associative downstep.

(91) Object downstep in the imperfective

ɓá-o-n-tá *ʄemba*
3p-ptp-3s-hunt monkey

'they are hunting a monkey'

ɓá-o-m-béɗa *ʄémbá*
3p-ptp-3s-take:impf monkey

'they are taking a monkey'

ɓá-u-úá *koko*
3p-ptp-paddle:impf canoe

'they are paddling a canoe'

ɓá-o-béɗa *kókó*
3p-ptp-take:impf canoe

'they are taking a canoe'

I now formalize declarative downstep, proposing that it involves the insertion of [-upper] between adjacent [+upper] features at the end of a declarative phrase. Downstep (74) then operates on the result.

(92) Declarative L insertion (post-lexical stratum)

II. [-upper]

III. - declarative

[+upper] ___ [+upper]]

Graphically, where the context is declarative,

```
 V V V   V V V          V V V   V V V
  \|/     \|/     -->    \|/     \|/            by the
[+upper][+upper]       [+upper][-upper][+upper] rule

                  -->   V V V   V V V
                          \|/                   downstep
                        [+upper][-upper]

                         V V V    V V V
                          \|/      \|/           UAC,
                        [+upper] [-upper]       spreading
```

(93) Derivation of *ɓákáɓí kasa* 'they looked for a paper/leaf'

[ɓákáɓí] [kásá] H/ / H/	Input from lexical derivation
[[ɓákáɓí][kásá]] H/ / H/	Concatenation
[[ɓákáɓí][kásá]] H/ / L˙ H/	Declarative L insertion (92)
[[ɓákáɓí][kásá]] H/ / L˙	Downstep (74)
[[ɓákáɓí][kasa]] H/ / L/ h/ / l/	UAC, Default L insertion, resolution of OCP, [raised] rules
[_ - - _ _]	Output intonation

5.2 Associative and oblique phrases

5.2.1 Associative and oblique downstep

This section examines downstep in constructions such as noun + noun, preposition + noun, gerund + noun. In reality they are mostly, if not all, instances of the same construction in Komo, namely, substantive + associative *á/a* + noun. As to the choice of tone for the associative, it seems to be toneless taking the same tone as the final tone of the head substantive, if that substantive is an adverb. Otherwise, it takes a high tone (e.g., in 'X of Y' constructions). Here is a partial list of such constructions.

(94) Associative and oblique constructions

frame	gloss
X á Y	'X of Y' (inalienable possession)
X ndéá Y	'X of Y' (alienable possession)
[verb] á X	[gerund] 'of X, his/her' [verb]ing
bă(t)-X	'behind X' (space) or a time distal from ego after or before X[45]
gú á X	'above X, on X'
ká X	'for X, on X, at X'
kángá	'without X'

[45]The [t] is realized before a vowel-initial noun.

kúsi a X	'below X'
mbenɔ á X	'the time of X' (when)
mosá X	'in front of X' (space) or 'before X' (time)
mbúsa a X	'behind X' (space) or 'after X' (time)
ngɔngɔ á X	'behind the back of X'
ɲɔngɔ á X	'because of X' (literally, 'affair of X')
sɔ́sɔɓɛ a X	'among X'

examples	gloss
mɔ á nkpa	'head of a person'
kínga á mĭki	'bicycle of the child'
támbá á mĭkí	'the walking of the child'
bă-mama	'after tomorrow'
bă-poso á mosá	'before last week'
băt-éndu	'behind the house'
gú á ntandɔ	'on the bridge'
kúsi a mamba	'below the hill'
mbenɔ á oíɔ	'the time of weeping'
mosá mĕ	'in front of (on the far side of) the tree'
mbúsa a masɛ́ɟɛ́	'after the feast'
ɲyɔngɔ á ganjá	'affair of circumcision'
sɔ́sɔɓɛ a bakpá	'among the people'

All of the preceding constructions usually trigger downstep on the adjunct noun if it contains a branching initial high tone[46] or if it is a monosyllabic word. Below is a paradigm of all bisyllabic noun melodies, followed by some multisyllabic examples.

(95) Associative phrase downstep (*kángá* 'without')

lexeme	gloss	frame: *kángá*	analysis
monosyllabic forms:			
jɔ́	'basket'	*kángá jɔ*	H --> [_]
ba	'hut'	*kángá ba*	L --> [_]

[46] I take the *adjunct* noun to be the noun on the right and the *head* to be the preposition or nominal on the left.

Some speakers do not have the requirement that the high tone be branching. That is, they downstep any high tone. This may be a language change in process.

bisyllabic forms:

kásá	'leaf'	*kángá kasa*	HH	--> [__]
cíɗɔ́	'jigger'	*kángá ciɗɔ*		
ɓóki	'honey'	*kángá ɓóki*	HL	--> [¯_]
kánga	'bird'	*kángá kánga*		
mɛní	'proverb'	*kángá mɛní*	LH	--> [_-]
pɛcá	'winnow'	*kángá pɛcá*		
bibi	'charcoal'	*kángá bibi*	LL	--> [__]
ɓamba	'lice'	*kángá ɓamba*		

multisyllabic forms:[47]

sékéké	'bird'	*kángá sekeke*	HHH	--> [___]
ɓúámbo	'another'	*kángá ɓuambo*	HHL	--> [___]
kóngóiɓa	'spider'	*kángá kongoiɓa*	HHLL	--> [____]
ɓáumángá	'crocodile'	*kángá ɓáumángá*	HLHH	--> [¯_--]
síɗɔ́ɔ́	'sawyer'	*kángá síɗɔ́ɔ́*	HLH	--> [¯_-]

These forms resemble more the subjunctive in the type of downstep taking place than declarative-final subject + object. I conclude that downstep in the oblique or associative phrase takes place lexically. My proposal is that the mechanism for associative or oblique phrase downstep involves the insertion of a low-tone prefix, just as it does with subjunctive and verb-phrase downstep. I call the process adjunct formation.

(96) Adjunct formation (inflectional stratum)

II. [-upper]
III. - nominal adjunct
- [___ [+upper]]
- target: branching or [___ [+upper]]

Graphically,

```
| [V V]      -->   [V V]   by the rule
|  |/               |/
|  H              L˚H
└adjunct

               -->  [V V]   downstep (74)

                    L˚
```

[47]Multisyllabic forms not containing a low-tone, noun-class prefix are rare. I am only showing forms of interest: those containing an initial high tone.

--> [V V] UAC, Default L insertion, OCP
|/ resolution
L

(97) Derivation of *kángá kasa* 'without paper/leaves'

[kángá] [kásá] Input from lexicon
H / H/

[kángá] [kásá] Nominal adjunct formation (96)
H / L˙H/

[kángá] [kasa] Downstep (74)
H / L˙

[kángá] [kasa] UAC, Default L insertion, OCP
H / L/ resolution

Post-lexical:

[[kángá][kasa]] Concatenation
H / L/

[[kángá][kasa]] [raised] default rules (85, 86)
H / L/
h / l/

[‾ ‾ _ _] output intonation

I next note that the rule for adjunct formation (96) as stated is independent of the tone on the associative marker. This is indeed the case; identical results obtain with a frame like *kúsi a...*'beneath the...'.

(98) Adjunct formation, low-tone associative marker

lexeme	gloss	frame: *kúsi a*	analysis	
monosyllabic forms:				
jɔ́	'basket'	*kúsi a jɔ*	H	--> [_]
ba	'hut'	*kúsi a ba*	L	--> [_]
bisyllabic forms:				
kásá	'leaf'	*kúsi a kasa*	HH	--> [__]
ɓóki	'honey'	*kúsi a ɓóki*	HL	--> [‾_]
pɛcá	'winnow'	*kúsi a pɛcá*	LH	--> [_-]
bibi	'charcoal'	*kúsi a bibi*	LL	--> [__]

This lends credence to an analysis that places adjunct formation in a lexical stratum. If adjunct formation were dependent on the tone on the associative *á* or *a*, one would expect adjunct formation to take place only upon concatenation with the high-toned associative. However, concatenation of two words, or even a (p)article and a word, would be expected to occur post-lexically (Mohanan 1986).

5.2.2 Elision, falling contours

Elision sometimes occurs upon concatenation of the associative and the adjunct, or of a preposition and an adjunct, if the adjunct begins with a vowel.

(99) Elision in associative and oblique phrases (*kángá* 'without')

adjunct[48]	*kángá* + adjunct	gloss
éndú	*káng'éndu*	'without a house'
élɛ́	*káng'élɛ*	'without a dog bell'
ésɔ	*káng'ésɔ*	'without a voice'
ɔ́ma	*káng'ɔ́ma*	'without a place'
eká	*káng'êká*	'without charcoal'
egá	*káng'êká*	'without epilepsy'
eka	*káng'éka*	'without a bed'
ɛdɔ	*káng'édɔ*	'without a net'

Of interest is elision with the associative *á*. In this case, the non-tonal content of the *á* entirely disappears. Only the high tone remains on the first syllable of the adjunct.

(100) Elision with *ɲɔngɔ á* 'because of'

adjunct	*ɲɔngɔ* + adjunct	gloss
éndú	*ɲɔngɔ éndu*	'because of the house'
ésɔ	*ɲɔngɔ ésɔ*	'because of the voice'
eká	*ɲɔngɔ êká*	'because of the charcoal'
eka	*ɲɔngɔ éka*	'because of the bed'

First, I note that H retrolinking does not take place, deriving something like **ɲɔngɔ̌ endu* in the first line above. I believe that this is due to the fact that adjunct phrase formation takes place before the adjunct is concatenated with the head noun. So the floating H of the associative has

[48]Only bisyllabic words can occur in this frame.

nowhere to link except rightwards at the stage of the derivation where it is encountered.

To account for these data, I propose that adjunct downstep first takes place in lexical derivation as indicated by the rule of nominal adjunct formation. Then, head and adjunct are concatenated and elision takes place. What is elided by the elision is the last vowel of the preposition or the [a] of the associative. Also, any previous lines of association of tone to the first vowel of the adjunct are deleted (the tone itself is not, as is seen in *ɲɔngɔ êká*). Next the UAC links the high tone of the associative to the first vowel of the adjunct. An additional tone rule is then needed.

(101) Elision, tonal part (post-lexical stratum)[49]

I. a. delete
c. structure
II. tonal node

III. - nominal adjunct

target: [V (CV)$_0$]

tonal node

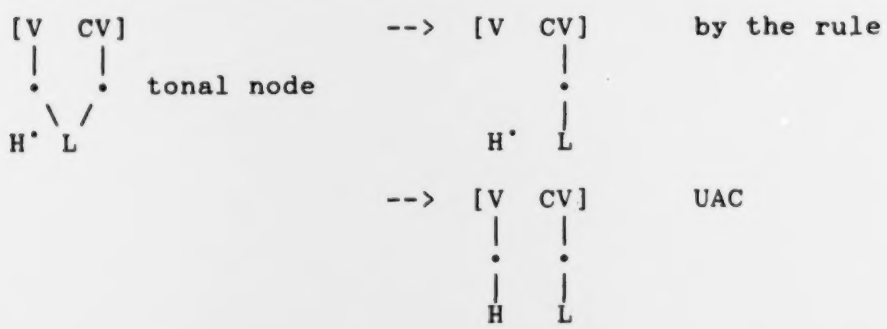
[any tone]

[49]One might propose that this rule is a mirror image of contour expansion (57) in combination with a rule of forelinking. For example:

ɲɔŋgɔ á eka L L H L L	'because of the bed'
ɲɔŋgɔ eka L L H L L	elision
ɲɔŋgɔ eka L L HL L	forelinking
ɲɔŋgɔ éka L L H L	mirrored contour expansion

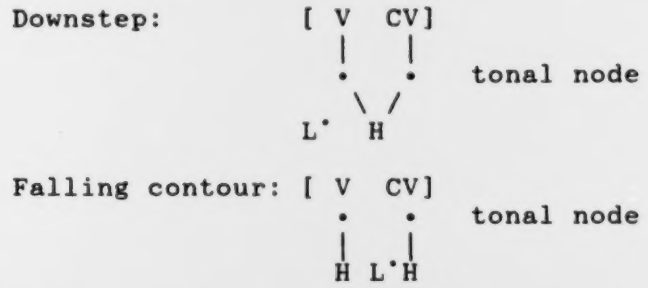
Unfortunately, (57) takes place between immediately adjacent vowels, and cannot apply here. Otherwise, a word like *ɓâkɔɟɔngaga* 'they are conversing there' would be expected to surface as **ɓákɔɟɔnga*. Furthermore, *káŋg éka* 'without the bed' would be expected to surface in non-mirrored contour expansion as **káŋg eka*.

Graphically, adding an associative H, a single CV and a low tone for expository clarity,



This takes care of the initial melodies HH, HL, and LL. There remains the problem of the falling contour instead of downstep where the initial melody was LH. To account for this, I first note that the target criteria for downstep is not met in this case.

(102) Comparison of downstep and triggering environment for a falling contour, bisyllabic case



In the case of downstep, the [-upper] autosegment is on the left side of the brackets. In the case of the triggering environment for a falling contour, the low-tone autosegment falls between two high tones whose anchors are within the same set of brackets. Thus, it is possible to state a rule of falling contour creation having a target distinct from that of downstep creation.

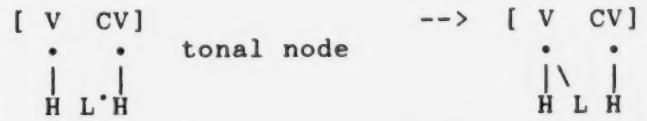
(103) L retrolinking (post-lexical stratum)[50]

I. c. structure
d. opposite direction (left to right)

II. [-upper]

III. [V CV]
• • tonal node
| |
H ___ H

Graphically,



Finally, it is of interest to see what happens when the associative has a low tone.

(104) Elision with *kúsi a* 'beneath'

adjunct	*kúsi* + adjunct	gloss
éndú	*kúsi endu*	'beneath the house'
íɓɔ	*kúsi íɓɔ*	'beneath the nest'
eká	*kúsi eká*	'beneath the charcoal'
ɛdɔ	*kúsi ɛdɔ*	'beneath the net'

Once again, nominal adjunct formation applies regardless of the tone of the associative marker, deriving an LL melody for *éndú*. If the same process of deleting the tonal node associated with the initial vowel of the adjunct is assumed, then the only problematic form is *kúsi íɓɔ*. In this case the floating L• links to the first vowel of *íɓɔ*, the floating H• links by retrolinking, and contour expansion applies to delete the L, as in the following derivation.

---

[50]L retrolinking cannot be combined with H retrolinking because the trigger/target conditions differ:

L H• for H retrolinking
H L• H for L retrolinking

(105) Derivation 1: *kúsi íɓɔ* 'beneath the nest'

Inflectional stratum:

```
          [íɓɔ]      input to adjunct formation
           | |
           H L

          [íɓɔ]      adjunct formation
           | |
          L˙H L
```

Post-lexical:

```
[[kúsi][a][íɓɔ]]     oblique phrase concatenation
   | |/    | |
   H L   L˙H L

[[kúsi ][iɓɔ]]       elision
   | |    |
   H L L˙H˙L

[[kúsi ][iɓɔ]]       UAC
   | |  /  |
   H L L H˙L

[[kúsi ][ĭɓɔ]]       H retrolinking
   | |  /| |
   H L L H L

[[kúsi ][íɓɔ]]       contour expansion, ((57) α = -)
   | |   | |
   H L   H L

[kúsi íɓɔ]           BE, output
  | | | |
  H L H L
```

(106) Derivation 2: *ɲɔngɔ éndu* 'because of the house'

Inflectional stratum:

```
          [éndú]     input from lexical insertion
           H /

          [éndú]     adjunct formation (96)
           L˙H /

          [endu]     downstep (74)
           L˙
```

```
                [endu]          UAC, default L insertion, OCP
                 L /              resolution
```

Post-lexical:

```
[[ɲɔngɔ][[á]][endu]]]           concatenation
   L /   H   L /

[[ɲɔngɔ á][endu]]               BE
   | /  |  | /
   L    H  L

[[ɲɔngɔ  ][endu]]               elision (101)
   | /        |
   L    H·     L

[[ɲɔngɔ  ][éndu]]               UAC and output
   | /      |  |
   L        H  L
```

(107) Derivation 3: *ɲɔngɔ êká* 'because of the charcoal'

Inflectional stratum:

```
              [eká]             input from lexical derivation
               L H

            [eká]               adjunct formation
          L· L H

              [eká]             OCP
               L H
```

Post-lexical:

```
[[ɲɔngɔ][[á][eká]]]             concatenation
   L /    H  L H

[[ɲɔngɔ][eká]]                  elision
   | /      |
   L   H·L·H

[[ɲɔngɔ][éká]]                  UAC
   | /  /   |
   L   H L·H

[[ɲɔngɔ][êká]]                  L retrolinking (103)
   | /  /| |                     and output
   L   H L H
```

5.3 More falling contours

I have shown two contexts where a falling contour tone is derived in Komo: the locative *k-* in imperfective constructions and in associative constructions where the adjunct noun has a lexical LH melody. In this section I display four more cases: monosyllabic class II and III verb stems with the perfective TAM, associative-linked possessives, associative-linked adjectivals, and incorporated adverbs.[51]

5.3.1 Monosyllabic, class II and III verb stems + perfective

Monosyllabic class II and class III verb stems (those with a lexical high tone) display a falling tone on the first (subject prefix) syllable if: (1) the stem is in the perfective; (2) the first syllable would ordinarily be linked to a high tone; (3) the verb is declarative-phrase final.

(108) Falling contours: verbs

Class II:

ɓá-jú?	*ɓâ-jú.*
3p-appear:pf	3p-appear:pf
'did they appear?'	'they appeared'
ɗó-í?	*ɗô-í.*
dp:2s-eat:pf	dp:2s-eat:pf
'did you eat?'	'you ate'

Class III:

ɓá-gú?	*ɓâ-gú.*
3p-fall:pf	3p-fall:pf
'did they fall?'	'they fell'
ɗó-jí?	*ɗô-jí.*
2s-return:pf	2s-return:pf
'did they return?'	'they returned'

[51]Some of the Bantu-specific parts of speech terminology have been borrowed from Bennett (1986).

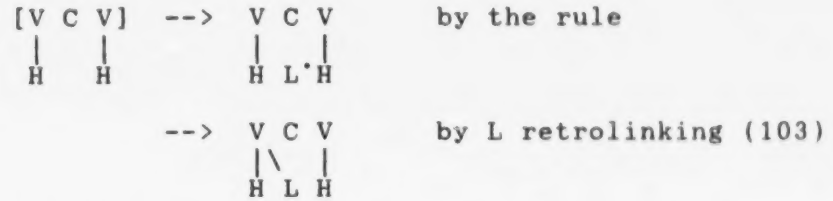
The rule that accounts for these forms derives an environment that triggers the L retrolinking already described in the section above on elision.

(109) L insertion

II. [-upper]
III. - declarative
- trigger: (linked)

[[+upper] ____ [+upper]]

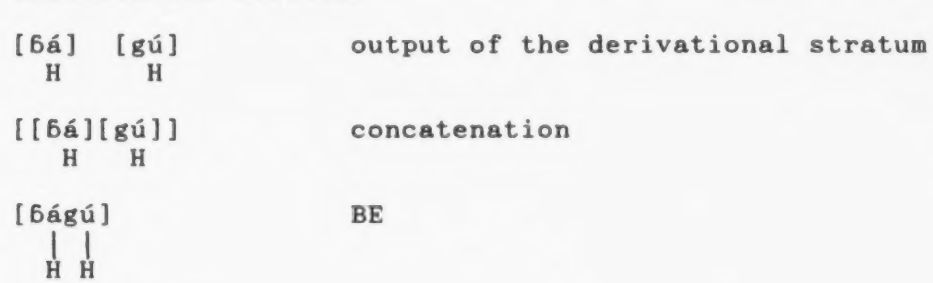
Graphically,



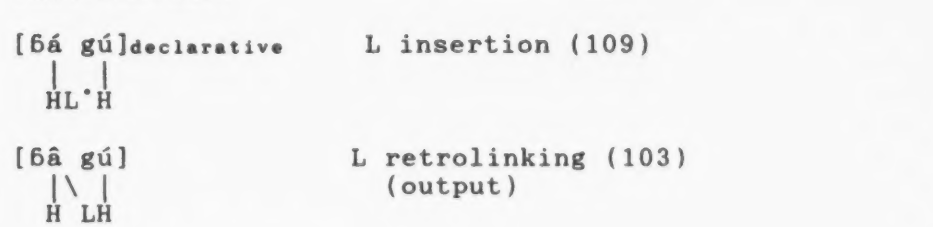
Apparently, this rule functions before the OCP creates a branching H tone that is linked to both stem and prefix.

(110) Derivation of *ɓâ-gú* 'they fell'

Inflectional stratum:



Post-lexical:



5.3.2 Digression: extratonality

The problem remains that L insertion does not occur in perfectives with multisyllabic stems. Cases like *ɓá-bédí* 'they took' would come to mind. It turns out, however, that such cases do not occur in the declarative-final position, due to a phenomenon known as extratonality.

Where a verb in the perfective or the imperfective occurs in a declarative-final position, the final syllable of a stem with two or more syllables is *extratonal*. *Extratonal* is defined in Pulleyblank (1986:198) to be a "...constituent at the edge of a tonal domain [that is] 'invisible' for the purposes of tonal rules." The only two 'rules' that can apply to an extratonal syllable are the UAC and default tone rules (L and 1).

The rule that extratonality blocks in Komo is H spreading. In the following table, I give various instances when H spreading is blocked. The first case is particularly interesting: where constraint (28) on HL sequences would normally prevent an HL melody from linking to two vowels not separated by a consonant, extratonality prevents H spreading to the final vowel during stem derivation. Post-lexically, the constraint no longer applies and so a final low tone is derived.

I note that the declarative-final low tones in the following examples, when whistled, have offglides that are indistinguishable from low tones that have not varied from their lexical values.

(111) H spreading and extratonality

Class II imperfective, -VV ending[52]

ɓá-o-kúá?	*ɓá-o-kúa.*
3p-ptp-die:impf	3p-ptp-die:impf
'are they dying?'	'they are dying.'

[52]Compare: *ɓáokúá ɓɔbu.* 'They are all dying.' (*ɓɔ́bú* 'all'), where extratonality does not operate and H spreading applies in the context of the HL constraint.

Class I perfective, 3 or more stem syllables

ɓá-bikísí?	*ɓá-bikísi.*
3p-come:cs:pf	3p-come:cs:pf
'did they have it come?'	'they had it come.'

Class Ia perfective, 2 or more stem syllables

ɗá-bětú?	*ɗá-bětu.*
dp:1s-limp:pf	dp:1s-limp:pf
'did s/he limp?'	's/he limped'

Class II perfective, 2 or more syllables

ɓo-béɗí?	*ɓo-béɗi.*
2p-take:pf	2p-take:pf
'did you take it?'	'you took it.'

Class III perfective, 2 or more syllables

ɓŏ-gúsí?	*ɓŏ-gúsi.*
2p:3p-fall:cs:pf	2p:3p-fall:cs:pf
'did you initiate them?'	'you initiated them'

(112) Derivation of *o-béɗísi* 'you had it taken' (declarative-final)

Derivational stratum:

[o] [bɛɗisi].	Non-tonal lexical input
H˙H˙ \	
ex	
[o] [béɗísi].	UAC, resolution of OCP
H/ \	
ex	
[o] [béɗísi].	Default L insertion (20)
L H/ \	
ex	

Inflectional stratum:

```
[[o][bɛ́ɗísi]].                    Concatenation
  L   H/   \
           ex

[obɛ́ɗísi].                        BE
 L H/   \
        ex
```

Post-lexical stratum:

```
[obɛ́ɗísi].                        Default L insertion
 L H/  |
       L
```

A problem remains with two-syllable class II stems which are assigned an H as a result of their stem class and an H as a result of TAM marking. Evidently, OCP deletion of one of the H's must occur before UAC linking. Otherwise, with a stem like *bɛ́ɗi* 'take:pf:declarative final', **bɛ́ɗí* would be the expected output of a derivation.

5.3.3 Associative-linked possessives

The inalienable possessive is formed by concatenating the associative *á/a* to one of a set of pronoun suffixes. The alienable possessive is formed by concatenating *ndéá* or its contractions *né* or *ná*, depending on the speaker's dialect, to one of the same set of pronoun suffixes as in (115ff).[53]

(113) Pronoun suffixes

1s: *-mɔ/-ni*[54]	1p: *-sú*
2s: *-kɔ*	2p: *-nú*
3s: *-ké*	3p: *-bó*

In the table below, the second element of each pair has declarative-final intonation, the first element has the intonation of any other position or of a question. Not shown

[53]This is one of a very few dialectical variations that exist. Generally, *ndéá* is used in northern areas, *né* is used from Lubutu south, and *ná* is used in the extreme southeast. It is probable that the latter two forms are contractions of the first form. However, since this is the only such contraction existent in Komo, I do not attempt an analysis of it here (or elsewhere).

[54]*-mɔ* is used for inalienable possession, *-ni* for alienable possession.

here are the effects of downdrift: the high tones in the second elements of the pairs are actually mid tones.

(114) Alienable possession

1s: *áni/áni*	1p: *ású/âsú*
2s: *ákɔ/ákɔ*	2p: *ánú/ânú*
3s: *áké/âké*	3p: *áɓɔ́/âɓɔ́*

(115) Inalienable possession using *ndéá*

1s: *ndéámɔ/ndéámɔ*	1p: *ndéású/ndéâsú*
2s: *ndéákɔ/ndéákɔ*	2p: *ndéánú/ndéânú*
3s: *ndéáké/ndéâké*	3p: *ndéáɓɔ́/ndéâɓɔ́*

(116) Inalienable possession using *né*

1s: *némɔ/némɔ*	1p: *nésú/nêsú*
2s: *nékɔ/nékɔ*	2p: *nénú/nênú*
3s: *néké/nêké*	3p: *néɓɔ́/nêɓɔ́*

(117) Inalienable possession using *ná*

1s: *námɔ/námɔ*	1p: *nású/nâsú*
2s: *nákɔ/nákɔ*	2p: *nánú/nânú*
3s: *náké/nâké*	3p: *náɓɔ́/nâɓɔ́*

Thus, regardless of dialect, a falling contour is obtained on the penultimate syllable when in the declarative-final position.

No new rules are needed if these forms are taken to be compounds of an associative or associative-like head and a pronoun adjunct.

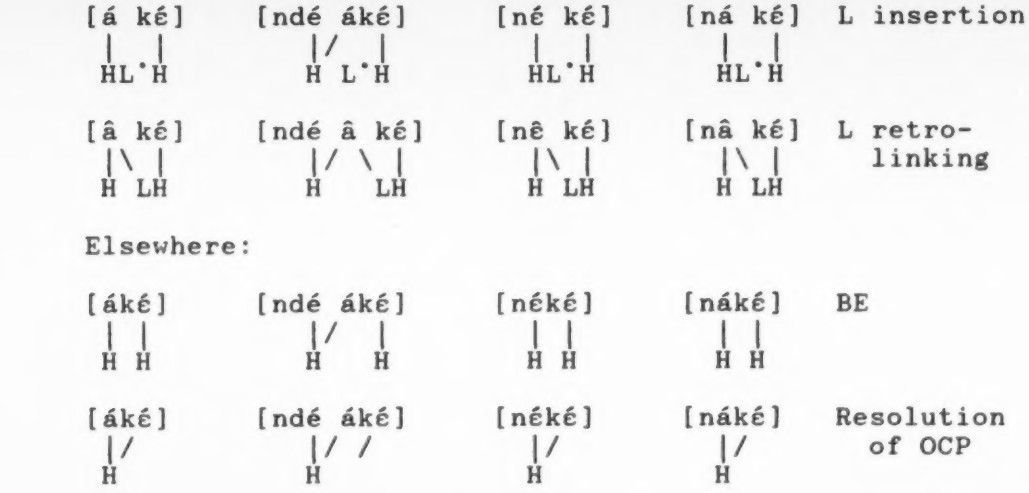
(118) Proposed structures and derivations of possessive constructions using the third person singular pronoun (cf. (114) - (117))

Underlying:

```
[[á][ké]] [[ndé á][ké]] [[né][ké]] [[ná][ké]]
  |   |       |/   |       |   |       |   |
  H   H       H    H       H   H       H   H
```

Declarative-final:

```
[áké]     [ndé áké]     [néké]     [náké]   BE
 | |        |/  |        | |        | |
 H H        H   H        H H        H H
```


[á ké] [ndé áké] [né ké] [ná ké] L insertion
HL˙H H L˙H HL˙H HL˙H
[â ké] [ndé â ké] [nê ké] [nâ ké] L retro-linking
H LH H LH H LH H LH
Elsewhere:
[áké] [ndé áké] [néké] [náké] BE
H H H H H H H H
[áké] [ndé áké] [néké] [náké] Resolution of OCP
H H H H

5.3.4 Associative-linked adjectivals

All substantives in Komo that act like adjectives are actually compounds that begin with the associative *á/a*. Following is a exhaustive list from my dictionary data base. Singular animate nouns must be modified by a reduplicated form. If a reduplicated form modifies an inanimate noun, it acquires a superlative nuance. Non-reduplicated forms modify inanimate nouns and plural animate nouns. In the case of plural animate nouns, there is a nuance that is described at the end of the section.

In the following table, I have indicated intonation for reduplicated forms in a declarative-final context. Elsewhere, a falling contour would instead remain a high tone.[55]

[55]The declarative-final forms assume that the head noun ends in a low tone which I take to be more basic.

kéma ânjá.
thing good:declarative

'good thing.'

See below for the case when the head noun ends in a high tone.

(119) Associative-linked adjectivals

base	unreduplicated	reduplicated	gloss
áboá		*áboboá*	'little'
(none)		*ábɔɗɔbɔɗɔ*	'slimy'
ábú	*âbú*	*âbúbú*	'white'
(none)		*ádɛdɛ*	'cold'
ádiá		(none)	'bitter'
áɛkɛ		*áɛkɛɛkɛ*	'sweet'
ágbɛɗɛ		*ágbɛɗɛgbɛɗɛ*	'soft'
ágbíki		*ágbíkigbíki*	'bumpy'
ájeɗe		(none)	'bad'
ájó	*âjó*	*ájójo*	'hot'
ákpɛ́	*âkpɛ*	*âkpɛ́kpɛ́*	'hard'
ágbae		*ágbaegbae*	'wide'
ángbí	*ângbí*	*ângbíngbí*	'short'
ángbó	*ângó*	*ângbóngbó*	'big'
ángbo		(none)	'another'
ánjá	*ânjá*	*ânjánjá*	'good'
njɛ		*ánjɛnjɛ*	'red'
áɲɛɓɛ		*áɲɛɓɛɲɛɓɛ*	'fine'
ácɗɛ		*ácɗɛcɗɛ*	'soft'
ácɔlɔ		*ácɔlɔcɔlɔ*	'lukewarm'
áΦí	*âΦí*	*âΦíΦí*	'black'
ási		*ásisi*	'many'
(none)		*átete*	'thick'

Adjectivals behave in a manner very similar to that of possessives. That is, declarative-finally, a low tone is inserted into a sequence of two high tones and a falling contour is derived. This is true both for base forms and for reduplicated forms where the second H is linked to two syllables.

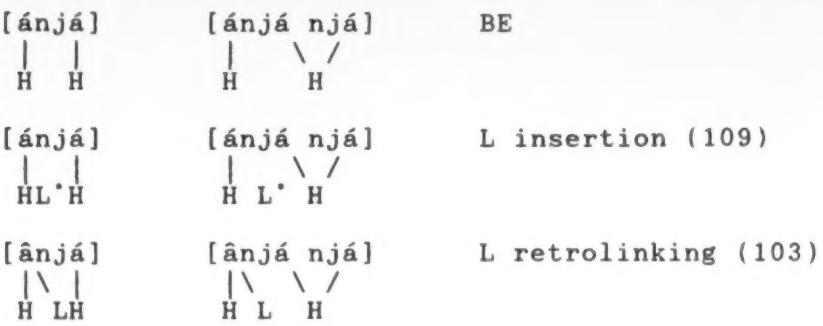
(120) Derivations of adjectivals, base form and reduplicated form (*ánjá*, *ánjánjá* 'good')[56]

Underlying forms:

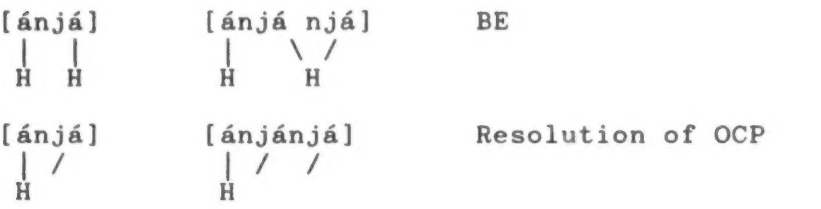
```
[[á][njá]]   [[á][njá njá]]
  |    |       |     \ /
  H    H       H      H
```

[56]Due to a paucity of data, I make no analysis of reduplication, per se.

Declarative-final:



Elsewhere:



When an adjectival modifies a plural animate noun, the adjectival is unreduplicated, and the two substantives are separated by the infinitive of being *ɓá*.

(121) Plural animate noun + adjectival

ɓa-kpá	*ɓá ánjá?*	*ɓa-kpá*	*ɓá anjá.*
cl.2-person	be good	cl.2-person	be good

'are they good people?' 'they are good people/the good people'

ɓa-níkí	*ɓá ánje*
cl.2-child	be red

'the red children/the children are red/are they red children?'

Ordinarily, one would expect a falling contour on the first vowel of the adjectival as happens in (120). Instead, there is a high tone on the infinitive of being, and a low tone on the first syllable of the adjectival. This in fact also occurs whenever a noun ending in a high tone precedes an adjectival.

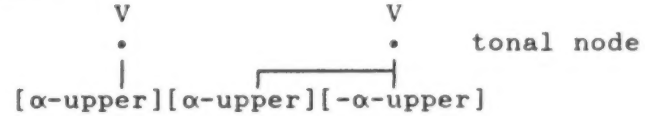
(122) Noun before adjectival

n-kpá	*anjánjá*	*sekɔ*	*ânjánjá*
cl.1-carve	assoc:good	chimpanzee	assoc:good
'a good person[57]'		'a good chimpanzee'	

I take the forms where the head noun ends in a low tone to be more basic. The rule of contour expansion, which was already introduced in the section on 3p object prefixes, accounts for the anomalous forms.

(123) Contour expansion ((57) repeated) (inflectional stratum)

I. a. delete
   c. structure
II. tonal node
III. target:



(124) Derivation of *nkpá anjánjá* 'a good person', declarative final context

Lexical stratum:

[[nkpá] [[á][njánjá]]].	Lexical input
H H H /	
[[nkpá] [ánjánjá]].	BE
H H H /	

Post-lexical stratum:

[[nkpá] [ánjánjá]].	L insertion (109)
H HL˚H /	
[[nkpá] [ânjánjá]].	L retrolinking (103)
| |\ | /	
H H LH	

[57] *kpá* forms the root for both the verb 'carve' and nouns like *nkpá* 'person' and *kokpá* 'dignity'. In the glossing, I consider the noun to be a nominalization of the verb. Apparently, Komo cosmology considers the genesis of humanity to involve the carving of an image, which is really not too surprising, given the widespread traditional use of wooden (carven) masks in Komo culture.

```
[nkpá ânjánjá].          BE
    | |\ | /
    H H LH

[nkpá anjánjá].          Contour expansion
    |   | /
    HH˙L˙H

[nkpá anjánjá].          OCP
    |   | /
    H  L˙H

[nkpá anjánjá].          UAC and output
    | |  | /
    H L  H
```

5.3.5 Incorporated adverbs

Certain adverbs can incorporate into verbs in the imperfective TAM.[58] In such cases, the last syllable of the subject complex dominates a falling tone if the first syllable of the incorporated adverb dominates a low tone.

(125) Incorporated adverbs

ɓó-o-ga	*â-gotó-o-ga*
2p:nar-ptp-go:impf	3s:nar-again-ptp-go:impf
'and (=nar) you went (no adverb)'	'and s/he went again'
ɓô-ko-ga	*ɓô-tɔ-o-ga*
2p:nar-loc:ptp-go:impf	2p:nar-only-ptp-go:impf
'and you went there'	'and you were only going'
ɓô-gǎké-o-ga	
2p:nar-however-ptp-go:impf	
'and you went, however'	
ɓó-Φótɔ-o-ga	*ɓó-ndíu-o-ga*
2p:nar-still-ptp-go:impf	2p:nar-anyway-ptp-go:impf
'and you were still going'	'and you went anyway'

[58]Such adverbs are inserted post-verbally in perfectives.

ɓó-ɟé-o-ga	*ɓó-ɟétɔ-o-ga*
2p:nar-indeed-ptp-go:impf	2p:nar-even-ptp-go:impf
'and you indeed went'	'and you even still were going'

ɓó-Φó-o-ga
2p:nar-first-ptp-go:impf

'and you should then go'

Indeed, there need not be any verbal morphology present to derive a falling contour.

(126) Adverb after subject copula

ɓá oáni	*ɓâ tɔ oáni*
3p here	3p only here
'they are here'	'they are only here'
ɓâ gotó oáni	*ɓâ gäkɛ́ oáni*
3p again here	3p however here
'they are again here'	'they are here, however'

Apparently, the adverbs with low tones on their initial syllables act as depressors of the subject-prefix tone. I state this as a rule.

(127) Subject prefix depression by incorporated adverb (post-lexical stratum)

I. c. structure
   d. opposite direction

II. [-upper]

III. [subject[adverb]][59]

Graphically,

```
[(C)V[CV(CV)]adverb]verb      -->     [(C)V [CV(CV)]]
    |     |                              |\ /
    H     L                              H L
```

[59]The exact mechanism of adverb incorporation, and therefore the bracketing exhibited, is just a hypothesis. Other analyses may be possible.

(128) Derivation of *ɓô-tɔ-oga* 'you are only going'

Post lexical:

[ɓóoga] HL/	Input from lexical strata after BE
[ɓó[tɔ]oga] | | |/ H L L	Adverb incorporation
[ɓô [tɔ]oga] |\ / |/ H L L	(127)
[ɓô tɔoga] |\ // / H L	BE and resolution of OCP, output

6 Conclusion and summary

Komo tonal processes occur in three strata: derivation, inflection, and post-lexical (or phonological phrase) derivation. The following rules and processes are peculiar to each.

(129) Tone rules summary, in order of application

Derivational stratum:

1. Verb stem and TAM tone insertion (8). Ordered first so that TAM tone does not apply to prefixes.

2. Distant past H insertion, and L after H in non-negative distant past constructions (63A,B)

3. Third person plural H tone insertion. (38)

4. Negative H tone insertion (44).

5. H spreading (21). Disjunctive with each of 2, 3, 4. In other words, just one H tone need apply to a subject morpheme complex; it spreads to any other syllable dominated by the subject morpheme.

6. Default L insertion (20). Disjunctive with 5.

Inflectional Stratum:

1. L insertion on the object after a high-tone subject (53)
2. Plural object high tone (51), disjunctive with 1.
3. H retrolinking (3)
4. Contour expansion (57), fed by 3.
5. Nominal adjunct formation (96)
6. Downstep (74), fed by 5
7. H depression by locative prefix or incorporated adverb (67) and (127). This occurs leftwards.
8. H depression by a nasal object prefix (47). This occurs rightwards.
9. Default L insertion (20), disjunctive with 2

Post-lexical:

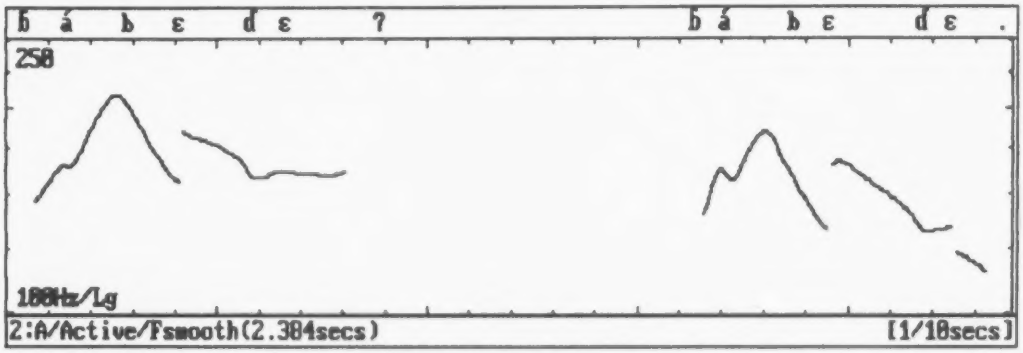
1. Declarative L insertion (92)
2. Downstep (74), fed by 1
3. Contour expansion, fed by 1
4. L insertion between two high tones (109)
5. L retrolinking (103), fed by 4
6. Default L insertion, where there is an extratonal syllable (20)
7. Interrogative intonation (84)
8. Downdrift (87)
9. Redundant [raised] (context = H) (86), disjunctive with 8
10. Default [raised] (85), disjunctive with 8 and 9

Appendix A. Instrumental analysis of downstep

Instrumental analysis of associative-phrase downstep does not always confirm the data obtained by asking Komo speakers to say a word or phrase, then whistle the same. The results are preliminary in nature, with the instrumental data having been elicited from one speaker over a three day time period. This is unlike the whistled data, which was collected over years and cross-checked with a number of speakers and in the presence of an experienced colleague.

First, I look at what instrumental analysis does confirm. Instrumental analysis confirms downstep in the subjunctive.

(A1) Instrumental analysis of *ɓábɛɗɛ?* 'They took it?' and *ɓábɛɗɛ* 'They took it.' (*béɗá* 'take')



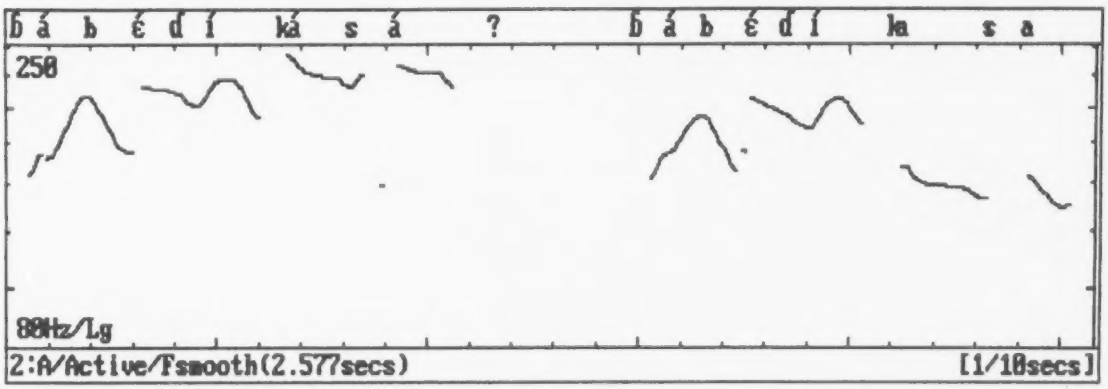
In the preceding chart, I note three things:

i) On both sides, there is clearly a difference in pitch between the high tone on the first syllable and the tones on the subsequent two syllables.
ii) The two final tones in the declarative show a steep offglide pattern that is characteristic of low tones.
iii) The obstruent [b] tends to have a depressor action on the preceding tone and a raising action on the following tone. This is an etic observation: native speakers do not imitate this when they whistle. The whistled melody is [¯__ ¯__]. This becomes clearer in the next example.

I thus take the instrumental data as confirming the analysis of subjunctive downstep as being a lexical phenomenon that is independent of whether the subjunctive has declarative or interrogative intonation.

An instrumental analysis of downstep in verb plus object phrases also confirms downstep.

(A2) Instrumental analysis of *ɓábɛ́ɗí kásá?* 'they took the paper?' *and ɓábɛ́ɗí kasa* 'they took the paper.' (*bɛ́ɗá* 'take', *kásá* 'leaf')



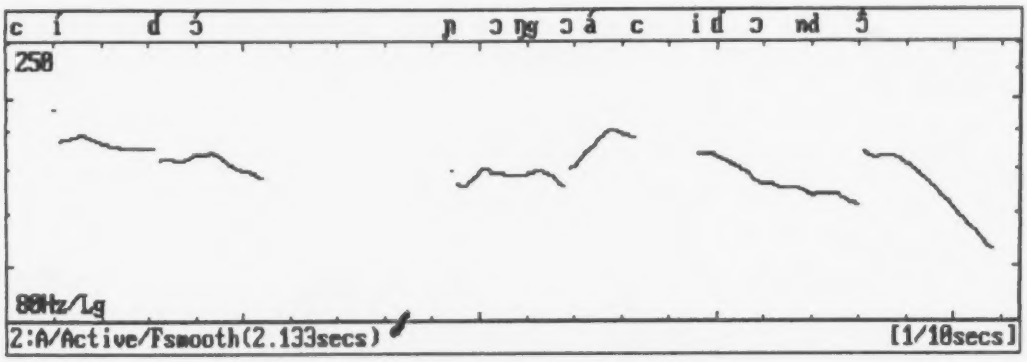
I again make some observations.

i) On the left side, there is no downstep. Indeed, succeeding tones seem to drift upwards.
ii) There is definitely downstep in the trace on the right of declarative intonation.
iii) Again, certain obstruents, particularly [k] and [s], again depress the preceding tone and raise the the leading edge of the following tone. As already said, such effects do not emerge in the whistle test.

Therefore, verb-object downstep as a post-lexical phenomenon that is sensitive to interrogative-declarative contexts is born out in instrumental analysis.

The instrumental data that I was able to obtain on associative phrases before having to leave the Komo area due to political turmoil was inconclusive.

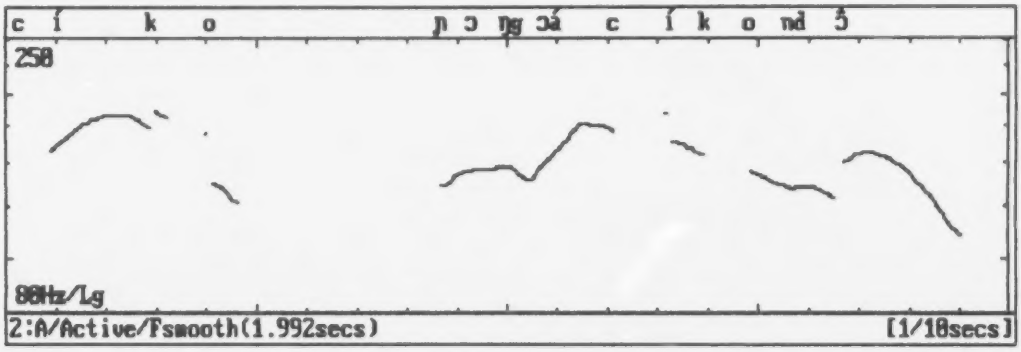
(A3) Associative plus noun with an HH lexical melody: 'louse, because of that louse' (*cíḍó* 'louse')



In the preceding chart, there is a small drop from 168 Hz to 159 Hz between the leading edges of the two occurrences of [í]. The [c] also appears to be an elevator obstruent that raises the leading edge of the subsequent tone.

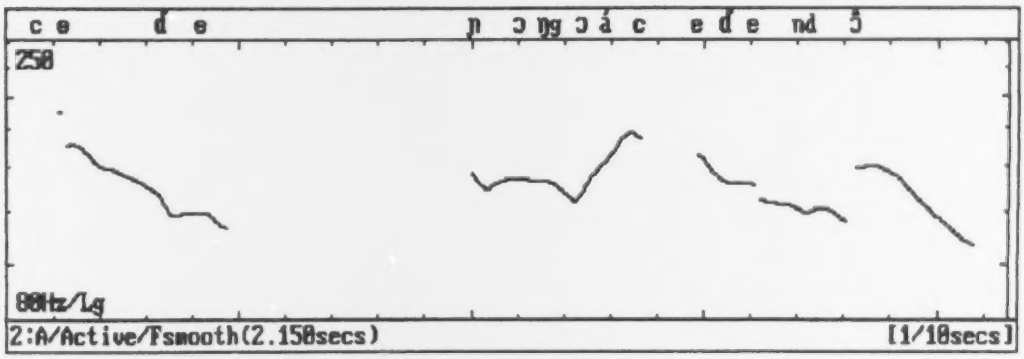
In the next chart, the shape of the trace on the right appears almost identical with the one above, except that the leading edges of the two [í]'s start at almost the same frequency.

(A4) Associative plus noun with an HL melody: 'field, because of that field' (*číko* 'field')



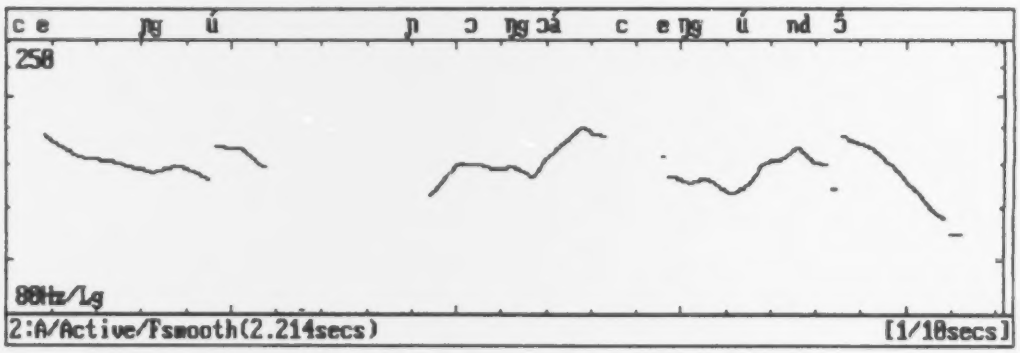
With an adjunct noun having a lexical LL melody, the trace has a shape almost identical to those of the previous two charts. Again, the leading edges of the two [e]'s are at almost the same frequency, and the [c] appears to be raising the leading edge of the following [e].

(A5) Associative-plus-noun with an LL melody: 'frog, because of that frog' (*cede* 'frog')



Finally, I examine the case of an associative-plus-noun with a lexical LH melody. Here, the low tone of the noun is a flat low, uninfluenced by the presence of the preceding [c]. This is perhaps due to some sort of adjacency principle at work, whereby the H on the final syllable of the noun prevents any elevating action by the initial [c]. The high tone of the noun has undergone downdrift with respect to the preceding [á].

(A6) Associative-plus-noun with an LL melody: 'poison, because of that poison' (*cengú* 'poison')



So, the the tonal traces of the adjunct nouns in associative constructions with HL, HH, and LL melodies are the same. This varies with the results of having speakers whistle the melodies, as shown in the following table.

(A7) Comparison of instrumental analysis and whistle elicitations of adjunct-noun tone melodies in the associative construction

lexical:		adjunct melody:	
lexeme	melody	whistled	instrumented
cíɗɔ́	HH	LL	FL
cíko	HL	HL	FL
cengú	LH	LH	LH
cede	LL	LL	FL

Thus, the psychological results (whistling) seem to vary from the instrumental results. I account for this by proposing that certain obstruents depress the tone of a preceding vowel and elevate the tone of a following vowel, except where pre-existing tones may block this action through some sort of an adjacency constraint. Such an etic effect may be neutralizing the effect of downstep which Komo speakers seem to perceive when they whistle the tones. More instrumental data is needed, however, before I can make any formalization.

ABBREVIATIONS

A hyphen in a morpheme by morpheme gloss means a morpheme break, while a colon indicates more than one morpheme synthesized in the form the gloss represents.

ATR	Advanced Tongue Root
BE	Bracket Erasure
C	Consonant
F	Feature or Falling tone contour
H	[+upper]
H˚	Floating [+upper]
HF	High-falling tone melody
HM	High mid tone
I.	Parameter setting portion of a formalized rule
II.	Argument portion of a formalized rule
III.	Trigger/target conditions of a formalized rule
L	[-upper]
L˚	Floating [-upper]
LR	Low-rise melody
M	Mid tone
N	Nasal
NP	Noun phrase
O	Onset
OCP	Obligatory Contour Principle
R	Rising tone contour or Rhyme (depending on context)
S	Syllable
TAM	Tense-aspect-mood marker
TG	Transformational Grammar
UAC	Universal Association Convention
V	Vowel
X	Skeletal position
appl	applicative
assoc	associative
[α-upper]	alpha-upper
cl.(N)	noun class N
cs	causative
def	default
dp	distant past
ex	extratonal
h	[+raised]
h˚	floating [+raised]
hab	habitual
impf	imperfective
int	interrogative
intr	intransitive
l	[-raised]
l˚	floating [-raised]

nar	narrative
neg	negative
obj	object
pf	perfective
pl	plural
recip	reciprocal
sub	subject
subj	subjunctive
tr	transitive
1p	first person plural
1s	first person singular
2p	second person plural
2s	second person singular
3p	third person plural
3s	third person singular
/	link of a tone to the right hand vowel
\	link of a tone to the left hand vowel
•	node (if by itself)
?	denotes interrogative intonation (in post-lexical representations)
.	denotes declarative-final intonation (in post-lexical representations)

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